RESPIRATORY COMPLIANCE IN CHILDREN ON MECHANICAL VENTILATION

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Dedicated

to

my Family,

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ABBREVIATIONS

AC	Assist Control
ARDS	Acute respiratory Distress Syndrome
CSTAT	Static compliance
DAMA	Discharge Against medical advice
DP	Driving pressure
FiO2	Fraction of inspired oxygen
GCS	Glasgow Coma Scale
MAP	Mean Airway pressure
MV	Mechanical ventilator
PC	Pressure control
PEEP	Positive end expiratory pressure
PICU	Pediatric ICU
PIP	Peak Inspiratory Pressure
PL	Transpulmonary Pressure
Ppeak	Peak pressure
Pplat	Plateau pressure
PRISM	Pediatric risk of mortality
PSV	Pressure support ventilation
RR	Respiratory rates
SIMV	Synchronized intermittent minute ventilation
SOFA	Sequential organ failure assessment
VAP	Ventilator associated Pneumonia
VC	Volume control
VT	Tidal Volume

ABSTRACT

Introduction: Static compliance is defined as the ratio of the change in volume (Inspiratory tidal) to the corresponding change in transmural pressure.

Aim: To study the compliance of lungs in children requiring Mechanical ventilator and to correlate it with the outcome including duration of ventilation, PICU stay and mortality.

Material and method: It was a prospective, non-interventional, observation study conducted in the Pediatric Intensive Care Unit of a tertiary care hospital, DMCH Ludhiana between July 1, 2022, to September 30, 2023. Pediatric patients (1 month-18 years) admitted to the PICU with clinical diagnosis of Respiratory failure and requiring MV support for >24 hours were included in the study.

Results: There was a statistically significant relationship between compliance with duration of ventilation, duration of PICU stay and mortality. Compliance was nonlinearly associated with mortality (CI -0.1, p value 0.001) and duration of ventilation (CI -0.019, p value 0.001). Compliance was linearly associated with PICU stay (CI-0.010, p value 0.002)

Conclusion: Compliance was found to be a diagnostic tool for predicting mortality, duration of ventilation and duration of PICU stay.

Keyword: Mechanical ventilation, static compliance, duration of ventilation, duration of PICU stay, mortality

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INTRODUCTION

Ventilation put in simple words is defined as movement of air in and out of lung with the primary aim of supplying the oxygen and removal of carbon dioxide along with other waste products of metabolism.

A ventilator is a mechanical device specially designed for the purpose of moving gases inside and outside the lung. (1)

One in every 3rd patient admitted to PICUs requires invasive mechanical ventilation. Estimated survival of infants and children requiring invasive ventilation for more than 12 hours is approximately 85%. (2)

A Ventilator consists of a compressor, humidifier, control panel, and a breathing circuit. Simply put compressed air mixed with oxygen is introduced into the ventilator with the help of a blender which can deliver a set FiO2. This oxygen-air mixture then undergoes humidification and is warmed up in a humidifier which is then delivered to the patient via a breathing circuit.

Three main indications for mechanical ventilation are to support oxygenation by improving delivery and/or by reducing consumption of oxygen through the work of breathing, to support lungs for CO2 clearance, and by reducing the work of breathing. (3)

Acute respiratory failure is the most common reason for mechanical ventilation (MV). (2) Some common conditions which require ventilatory support are for treatment of apnea and poor respiratory effort, to prevent or treat lung atelectasis in post operative setting or neuromuscular disease, to maintain patency of airway, to decrease systemic and myocardial oxygen consumption as in shock, to stabilize chest wall, to relieve respiratory distress, to reverse acute respiratory acidosis and for correction of hypoxemia. (4)

Among the various modes available in MV, patient triggered ventilatory modes namely Synchronized intermittent minute ventilation (SIMV), Pressure support ventilation (PSV) or Assist control (AC) are usually

preferred because they have been found to be associated with reduction in air leak therefore patients have a shorter duration of ventilation.

In Assist Control mode, all breaths are assisted, and they are delivered in synchrony with patients' own spontaneous efforts. AC mode of ventilation also helps in unloading respiratory muscles. SIMV PC mode of ventilation allows spontaneous breaths in between mandatory breaths which are completely unsupported therefore they help in keeping respiratory muscles active. PSV is more comfortable for the patient, and it requires less sedation as the patient can control the rates, inspiratory time, and flow rate.

Among these modes, AC mode is associated with shorter duration of weaning than SIMV mode. [5]

The benefits and potential harms of ventilation depend not only on the adjustment of ventilator parameters which are displayed on ventilator but also on the ventilator-derived parameters which need to be calculated and interpreted. Both ventilator derived parameters and ventilator parameters can be used to guide ventilatory strategies. The basis of this process relies on the complex interaction between the physical forces that act on lung structures during mechanical ventilation adjusted by the operator and the lung and chest wall compliance of the patient [6]

Once the inputs like tidal volume, Peek inspiratory pressure, positive end-expiratory pressure and respiratory rate are adjusted, the information obtained from the mechanical ventilator i.e. the outputs also referred as the ventilator-derived parameters can be calculated. Regardless of various modes of ventilation, ventilator derived parameters that should be recorded to avoid harmful effects [7,8]: driving pressure (DP), plateau (Pplat) pressures, intrinsic PEEP (PEEPi), peak (Ppeak), and transpulmonary pressure (PL).

Peak pressure refers to the pressure achieved during inspiration when the air is being pushed by the ventilator into the lungs .PIP is a measure of airway resistance.

Plateau pressure (Pplat) refers to the static pressure that is attained at the end of a full inspiration. For measuring the plateau pressure, patient needs to be sedated, paralyzed and inspiratory hold must be performed on the ventilator so as to permit the pressure to equalize through the respiratory tract. Plateau pressure is the sum total of lung compliance and alveolar pressure. Normal plateau pressure is usually below 30 cm of H20. Higher plateau pressure can lead to barotrauma.

PEEP refers to the alveolar pressure above the atmospheric pressure at end of expiration. Extrinsic PEEP applied by the ventilation delivers a positive pressure at the end of expiration to prevent alveoli from collapsing thereby keeping them patent throughout the respiratory cycle. PEEP between 3 to 5 cm of H_2O are routinely used in pediatric patients on mechanical ventilation. It keeps lungs forced open at the end of expiration thereby promoting alveolar stabilization [9]

Driving pressure is defined as Pplat-PEEP

Tidal volume is defined as the volume of air moving inside and outside the lungs in each cycle of respiratory.

FiO2 refers to the percent of oxygen in the air-oxygen mixture that is being delivered to the patient.

Flow is defined as the speed (liters per minute) at which the ventilator delivers the breath.

Intrinsic PEEP (PEEPi) is the residual pressure when the expiratory phase is not completed to full exhalation. This residual pressure is usually higher than the point of equilibrium of the respiratory system's elastic properties. [10] Performing expiratory pause and looking for end expiratory pressure is one easy way of looking for intrinsic PEEP. Intrinsic PEEP is usually seen in obstructive diseases [11] but may be observed during other conditions; therefore, it is considered an indispensable ventilator-derived parameter for monitoring.

The transpulmonary driving pressure (DP_L) is the difference between P_L at end of inspiration and P_L at end of expiration. It is a reflection of the distending pressure of the lungs when V_T is being delivered [12]

The main properties of respiratory mechanics are compliance and resistance.

Pulmonary compliance (C) is the total compliance of both the lungs, a measurement of the amount to which both the lungs will distend i.e change in volume of lungs for each unit increase in the trans-pulmonary pressure. Lung compliance is simply the measure of distensibility of the lungs [13] lung compliance can categorized as static or dynamic based on the method of measurment.

Dynamic Compliance is defined as the continuous measurement of pulmonary compliance at each point thereby representing the schematic changes during rhythmic breathing. Dynamic compliance is measured in the presence of airflow. It therefore includes both the elastic resistance and the airway resistance of the lung and the chest wall.

Static compliance (CSTAT) is defined as the ratio of the change in volume (Inspiratory tidal) to the corresponding change in transmural pressure. It represents pulmonary compliance when the muscles are relaxed and there is no airflow across the tract at the given fixed volume. This situation takes place when transpulmonary pressure becomes equal to the elastic recoil pressure of the lungs. It only measures the elastic resistance and not the airway resistance. [14]

Static compliance can be measured continuously and dynamically by the least squares fitting method (LSF). [15]

The change in transmural pressure is calculated by dividing plateau pressure (Pplat) from total PEEP(PEEPt) which can be obtained by the end-inspiratory and end-expiratory pause, respectively.

$CSTAT = VT/\Delta P = VT/ (Pplat- PEEPt)$

The dimension of compliance is ml/cm of H_2O [16,17]

In adult patients without any underlying lung pathology, normal CSTAT is 50–60 ml/cmH2O [18]

Low compliance would mean the underlying lungs are either stiff and noncompliant, making the lung expansion difficult and it increases the work of breathing (e.g. acute respiratory distress syndrome). High compliance will mean incomplete exhalation, decreased CO2 elimination and air trapping due to scarcity of elastic recoil in the lung (e.g. emphysema)

So, compliance decreases in conditions like ARDs, atelectasis, Obesity, Pleural effusion, Pneumothorax, abdominal distension, consolidation and Retained secretions and increases in Emphysema(adult), Flail chest, Sternotomy. Hence studying Compliance can help us diagnose lung conditions, impairments, and potential guide us in the adjustment of ventilatory settings. [19]

Elastance (E) is practically reciprocal of static compliance.

$E = \Delta P / V_T$

Resistance (R) is the opposition offered to the gas flow moving into the respiratory system at the time of inspiration caused by numerous frictional forces. Resistance is defined as the ratio of the pressure driving a given flow to the resulting flow rate ($\dot{V}$).

$R = \Delta P / \dot{V}$.

The resistance is essentially the sum of the resistance of the airways and the endotracheal tube as the resistance offered by the lung tissue is very less. In mechanically ventilated patients with underlying disease-free lungs, inspiratory resistance (RINSP) is 10–15 cm/ H2O.

Respiratory mechanics including compliance and resistance have been studied in adults. Currently there is not much literature available on the relation of respiratory compliance with the overall outcome in children. Since children end up in respiratory failure due to variable causes, studying respiratory mechanics can provide us with a good prognostic marker to determine the outcome. In children, primarily Pressure control

mode is used in which compliance can be checked (C static displayed on ventilator) but not resistance. This study was prospectively conducted to know the Compliance of lungs in children requiring MV and to correlate it with the outcome including duration of ventilation, PICU stay and mortality.

AIMS AND OBJECTIVES OF THE STUDY

- To study the compliance of lung in children requiring MV
- To correlate Compliance with duration of ventilation, PICU stay, outcome.

REVIEW OF LITERATURE

Mechanical ventilation is the foundation of modern pediatric intensive care medicine. In the past few years, this modality has revolutionized into a highly complex and specialized discipline [20]

Invasive mechanical ventilation is a lifesaving intervention that is commonly used in critical patients who either need respiratory support or airway protection. They help in maintaining gaseous exchange while other treatments are being administered to improve the clinical condition. Lawen and Sievers provided the first definition of mechanical ventilation in the year 1910. Their ventilator administered only positive and negative pressure *with the help of a* piston cylinder. [21] From the "iron lungs" used in the 1900s to treat respiratory paralysis seen in poliomyelitis, modern ventilators have evolved into sophisticated devices based on micro-processor technology capable of performing a large number of functions with a number of safety mechanisms to make them safe for the patient [22]

Modern day ventilators use a computer-based interface to provide various modes of ventilation (pressure *versus* volume), synchronize the ventilatory breaths with the patient's own effort, and adjust the inspiratory flow patterns to improve gas exchange.

According to the definition given by Chatburn, a mechanical ventilator was defined as an fully automated machine in which". Energy is transmitted or transformed (by the ventilator's drive mechanism) in a predetermined manner (by the control circuit) to augment or replace the patient's muscles in performing the work of breathing." [23]

Mechanical ventilation (MV) therefore works by administering a positive pressure breath and is reliant on the resistance and compliance of the airway. As read in physiology during spontaneous inspiration, negative pleural pressure is generated by the inspiratory muscles creating a transpulmonary pressure which leads to the expansion of lungs. On the other hand, during controlled invasive ventilation, a positive airway pressure is generated by the MV which drives the gases into the lungs. [24]

Mechanical ventilation has numerous effects on lung mechanics. As explained earlier, normal respiratory physiology works on the principle of negative pressure system. When the diaphragm moves downwards during inspiration, negative pressure is generated in the pleural cavity, which, in turn, generates a negative pressure in the airways that leads to sucking of air into the lungs. This negative intrathoracic pressure also reduces the right atrial (RA) pressure thereby generating a sucking effect on the inferior vena cava (IVC) which leads to increased venous return. On application of positive pressure ventilation, this physiology changes. The positive pressure of the created by the mechanical ventilator is transferred from the upper airways to the alveoli, which in turn is transferred to the alveolar space and thoracic cavity, generating either a positive pressure or a less negative pressure in the pleural space. The resultant increase in RA pressure leads to reduction in venous return which reduces the preload. This exerts a dual effect in reducing the cardiac output: Less blood in the right ventricle leads to less blood in the left ventricle therefore less blood is pumped out, which finally results in reduced cardiac output. Reduced preload means that the heart is working at an inefficient point in the frank-startling curve, doing less work and thereby further reducing the cardiac output, which in turn leads to a decrease in mean arterial pressure (MAP) if there is lack of counter regulatory response by increase in systemic vascular resistance (SVR). This mechanism has to be kept in mind for patients with distributive shock (septic, anaphylactic or neurogenic shock) who may not have the capacity to increase SVC. In contrast, mechanical ventilation by exerting positive pressure greatly reduces the work of breathing which on the other hand reduces the oxygen demand of respiratory muscles and redistributes it to major critical organs of the body like brain and heart. This also decreases the production of CO2 and lactate from overexerted respiratory muscles and helps in improving acidosis. [25]

The primary indication for invasive ventilation is divided into the following categories:

1. Airway disease of compromise. [26]
    - Airway protection for patients who either have a dynamic airway disease or are obtunded e.g., oropharyngeal infection or from trauma.
    - Airways obstruction which can be either proximal (e.g. angioedema) or distal (acute exacerbation of chronic obstructive pulmonary disease or asthmatic bronchospasm).
2. Hypoventilation is either due to pump failure, impaired drive, or in the scenario of complete inability to maintain the exchange of gases resulting in type 2 respiratory failure or hypoxia with hypercapnic . The etiology can further be subdivided into the categories mentioned below:
    - Obtunded central drive (e.g., secondary to drug overdose) [27]
    - Respiratory muscle paralysis or weakness as in cases of muscular dystrophy and myositis [28]
    - Peripheral nervous system disorders (e.g., myasthenic crisis or Guillain-Barré syndrome) [29]
    - Restrictive ventilatory defects as in cases of massive pneumothorax or effusion or chest wall trauma or disease)
3. Hypoxemic with no hypercapnia or type 1 respiratory failure can be either due to lack to exchange of oxygen at the level of alveoli or inability to deliver it to the periphery due to any of the below mentioned reasons:
    - Alveolar filling disorders (e.g., pulmonary edema, pneumonia, acute respiratory distress syndrome)
    - Pulmonary vascular disorders resulting in ventilation-perfusion (VQ) mismatch as in massive air emboli or pulmonary embolism.
    - Diffusion disorders as in advanced pulmonary fibrosis

4. Increased oxygen demand due to shock, severe sepsis or in cases of severe metabolic acidosis [30]

Various inspiratory parameters are tidal volume (V_T), respiratory rate (RR), positive end-expiratory pressure (PEEP), Fractional of inspired Oxygen (FiO2), driving pressure (DP), peak (Ppeak) and plateau (Pplat) pressures,

Tidal volume: Amount of air moving in and out of the lungs with each one cycle of respiration.

FiO2: Amount of oxygen in percentage in the mixture that is being administered to the patient by the ventilator.

Flow: Speed (liters per minute) with which the ventilator delivers breath.

PEEP: it is defined as the positive pressure that remains in the airways at the end of exhalation which is greater than the atmospheric pressure

RR: Number of breaths delivered in a minute

Peak pressure (Ppeak): Peak pressure is defined as the maximum pressure delivered which can measured at end inspiration. Ppeak is composed of both the elastic and resistive components i.e. the airway, lung tissue, and equipment like endotracheal tube. Ppeak and Pplat difference can be obtained easily by pushing the inspiratory pause maneuver in controlled invasive ventilation.

Plateau (Pplat) pressures: Plateau pressure is measured when the airflow is zero and respiratory muscles are relaxed by pressing the inspiratory pause maneuver,

Driving pressure (DP): Driving pressure is defined as plateau pressure minus PEEP

Oxygenation can be achieved by 2 techniques either by intensifying the fraction of inspired oxygen (FiO2%) or by exerting the positive end-expiratory pressure (PEEP). Both these mechanisms i.e. both patient's ventilation and oxygenation can be modified by the clinician by putting a patient on mechanical ventilation therefore it plays an imperative role in

the management of acute hypoxic and hypercapnic respiratory failure in addition to severe metabolic acidosis or alkalosis. [31, 32]

Mechanical ventilation is regulated through two control variables:

1. **Volume Control (VC):** This ventilation mode allows the critical care practitioner to administer a preset volume of air to the lungs of the patient. As the volume delivered remains constant, the peak inspiratory pressure (PIP) can vary based upon the patient's airway resistance and lung compliance, The key benefit of having a patient on VC is the guarantee of a consistent minute ventilation thereby enabling the practitioner to accurately manage patient's respiratory gas exchange.
2. **Pressure Control (PC):** In this mode, the operator sets the specific pressure level that can be achieved with each breath given. While the pressure is constant, the volume of air that the patient receives can fluctuate, based on the airway resistance and lung compliance of each individual. The primary advantage of PC is the checkpoint it provides against overinflation of the lungs, thereby reducing the risk of barotrauma and many other ventilator-induced lung injuries, as it prevents excessive distending pressure on the lungs. [33]

The ventilator mode decides regarding the delivery of the breaths, synchronizes it with the patient's own respiratory efforts, and how it will respond to the patient's respiratory demands. The popularly used modes in clinical settings are Pressure Support Ventilation (PSV), Assist/Control (A/C), and Synchronous Intermittent Mandatory Ventilation (SIMV)

Assist-control is one of the most used modes of ventilation in pediatric intensive care units. This mode works on the principle of delivering a minimum number of predetermined mandatory breaths, but the patient can also trigger his own breaths which will then be assisted by the ventilator thereby reducing the load on respiratory muscles. A key point in the AC mode is that the tidal volume of each breath, whether spontaneous or mandatory delivered will be the same, indiscriminatory of whether it was triggered by the ventilator or patient. At the beginning of each cycle, the

ventilator detects the patient's own attempt at inhalation by either sensing the inspiratory flow or the negative airway pressure. The flow or pressure threshold required to trigger breath is adjusted by the intensivist and is referred to as trigger sensitivity. If a breath is not started before the obligatory time regulated by the preset respiratory rate (RR), the ventilator will deliver the breath at the set tidal volume. For example, if RR has been set at 10 breaths per minute and the patient does not have any spontaneous breaths, then the ventilator will administer one breath every 6 seconds to the patient; this mechanism is referred to as time-triggering. Likewise, if RR has been set at 12 breaths per minute, the ventilator will give a breath every 5 seconds to the patient. But in case if the patient starts a spontaneous breath, then in AC mode, that breath will be delivered at a set Vt; these breaths will then be patient-triggered rather than time-triggered. [34] This mode results in enhanced patient comfort by the virtue of their ability to trigger breaths as and when needed. Operator-controlled CO2 levels of the patient allow for easy rectification of respiratory acidosis or alkalosis and reduces the patients work of breathing. The disadvantages of this mode of ventilation is that it is volume-cycled making barotrauma a point of concern in stiff lungs. Routinely tracing plateau pressures can help ameliorate this. If patient becomes tachypneic or does not get enough time for exhalation, the patient can develop auto-PEEP and breath stacking. So, in the process, not all volume is exhaled with every breath, which in turn increases the aggregate volume of air in the patient's lung along with the plateau and intrathoracic pressure. This can also cause hypotension because of decreased venous return. To ameliorate this phenomenon, disconnecting the patient from the ventilator and changing the setting may help the by allowing enough time for complete exhalation. Hyperventilation can also cause respiratory alkalosis. All of this can be reduced by increasing the patient's sedation levels [35]

Synchronized intermittent mandatory ventilation (SIMV) allows for spontaneous breaths while delivering a preset mandatory breath with a set tidal volume at the same time. Spontaneous breath will be delivered when the pressure of the airway goes below the end-expiratory pressure (trigger). The ventilator in turn tries to harmonize the mandatory breaths with the spontaneous breaths of the patient. In comparison to assist control ventilation (ACV), SIMV administers the spontaneous breaths that are100% determined by patient effort. SIMV was initially used in the 1970s as a mode to wean off patients from invasive ventilation.[36] In a survey done in the 1980s ,SIMV was found to be the most popular mode for weaning the patients with approximately 90.2% of hospitals using SIMV rather than AC mode of ventilation. [37] Synchronized intermittent mandatory ventilation since then has been used to help wean patients from the ventilator. [38] Compared to AC mode of ventilation, SIMV has the benefit of reducing the acute respiratory alkalosis by permitting the patients to maintain normal alveolar ventilation through an intact respiratory drive. [39] One of the drawbacks of SIMV is that it increases the work of breathing. Adding pressure support is one of the ways to avoiding this complication. [40] Mechanical ventilation is usually initiated in the presence of severe hypoxic or hypercapnic respiratory failure, often switched to after a failed attempt at non-invasive mode of ventilation. [41] Synchronized intermittent mandatory ventilation provides partial mechanical support by allowing spontaneous efforts with their volume being dependent on the patient's own effort. [42]

Pressure support ventilation (PSV) is defined as the mode of positive pressure ventilation in which every breath will be triggered by the patient. This is the most comfortable mode of ventilation for patients and is also useful for weaning the patient off from invasive ventilation. [43] No mandatory breaths can be set in PSV; thus, minimum minute ventilation is not ensured [44] It can also be used for performing spontaneous breathing trial (SBT) to ascertain if the intubated patient is prepared for extubation.

The driving pressure delivers a tidal volume and an aggregate minute ventilation that is much higher than what the patient can achieve without the support of a ventilator. This increased minute ventilation enhances oxygen delivery and the removal of carbon dioxide. PEEP also improves oxygenation by maintaining the patency of distal airways and alveolar sacs during the expiration thereby correcting the ventilation/perfusion (V/Q) mismatch of the lungs. In addition, the work of breathing reduces leading to decreased oxygen consumption. [45] Pressure support ventilation is an absolute contraindication in patients with depressed respiratory drive, increased airway resistance or a high oxygen consumption. The risk of hypoventilation is present in patients with neurological injury, encephalopathy secondary to a critical disease, or those on sedation. Work of breathing along with oxygen consumption is more in PSV as compared to other modes of ventilation. PSV is relative contraindication in patients with shock or low cardiac output due to the above-mentioned reasons. Obstructive lung disease has high airway resistance which in turn decreases the peak flow and can potentially lead to smaller tidal volumes. [46]

Newer ventilator modes are available which have been designed to ameliorate some of the pitfalls of conventional ventilation:[47]

- Neurally adjusted ventilator assist (NAVA): in NAVA mode of ventilation, sensors are placed in the diaphragm to measure the amplitude and time of the patient's respiratory own effort and then synchronize it with the timing and amplitude of the ventilator interface, thereby reducing the chances of barotrauma and ensuring ventilator demand achievement. [48]
- Adaptive support ventilation (ASV): ASV instinctively adjusts to the respiratory rate and inspiratory pressure thereby reducing the work of breathing of the patient by assuring the delivery of target minute ventilation ([49]
- Airway pressure release ventilation (APRV): APRV is a pressure-cycled mode of ventilation which delivers a continuous set of pressures for a set

period of time and then allows for a release, i.e. gives time to the lung to deflate for a shorter time period. In theory, alveolar inflation is maintained thereby preventing alveolar damage. This mode sometimes is now being used in patients on AC mode of ventilation where AC cannot be securely continued due to constantly high plateau pressures and persistently poor oxygenation [50]

Calculating compliance and resistance of the respiratory tract is imperative during the administration of mechanical ventilation, Compliance is calculated as change in volume divided by change in pressure. Total compliance in respiratory physiology is a sum total of lung and chest wall compliance as these two components are inseparable in a patient. In a mechanically ventilated, normal patients' compliance is recorded as 50-100mL/cmH20 and normal value of resistance is 1-8cmH20/L/s. In ARDS and cardiogenic pulmonary oedema, patient has a low compliance (around 40mL/cmH2O) along with elevated resistance (15cmmH2O/L/s). In COPD and asthma both are increased that is high compliance (66mL/cmH2O) and higher resistance (25cmH2O/L/s). [51] Two ways of recording compliance are: dynamic and static. Dynamic compliance is the compliance measured during breathing, so it entails the sum total of both lung compliance and airway resistance. Static compliance is calculated when there is no airflow. It is achieved in a ventilator by pressing the inspiratory pause. Commonly Pressure-volume curves are used to elicit the relationship between dynamic and static compliance where the slope of the curve represents compliance. [52] Pulmonary Compliance can be directly measured in a patient on ventilator. For greater accuracy, airway resistance can be eliminated as a Contributory factor by preferring static over dynamic Compliance. To measure static compliance, the practitioner takes the end-expiratory alveolar pressure and end-inspiratory alveolar pressure. After plotting the above measurements, the slope obtained represents lung compliance. Compliance has been found to be a useful bedside tool. [53]

A Study depicts that approximately 30 % of children that are admitted to pediatric intensive care need intubation and mechanical ventilation. Most common reason for intubation is because of respiratory and cardiovascular disorders. [54,55] Among those who survive, 1% of the patients have long term sequel in terms of chronic respiratory failure [56], which is described as patients requiring invasive ventilation for greater than a month. Mechanical ventilation is frequently needed in pediatric population to mitigate respiratory distress, ensure adequate exchange of gas, and enable rectification of pulmonary or other disorders. However, several hurdles are faced in pediatric population as there is a scarcity of large-scale randomized controlled trials to generate data and form clinical guidelines and consensus. [57]

Pediatric Mechanical Ventilation Consensus Conference (PEMVECC) in its statement made the acknowledgment that most of the common clinical practice in pediatric mechanical ventilation is usually built upon the personal experiences and extrapolation of the adult and neonatal guidelines to the pediatric population. [58] Pediatric mechanical ventilation and the associated lung injuries have been poorly explored, with most data on MV being either observational or retrospective and only a handful of them being randomized controlled trials. [59]

Huge variation in size, lung maturation and the wide spectrum of diagnoses in pediatric population have further made their contribution to the already existing problem of lack of clinical guidelines for ventilation in pediatric. [60, 61] The general concept of applying adult ventilation strategies to neonatal lungs is an erroneous strategy as neonates are yet to form alveoli or cells which produce surfactant. Children, who are still more comparable to adults with respect of their lung pathologies and associated comorbidity, the development of alveolarization is believed to resume till 8 years of age [62] and sometimes even through adolescence. [63] In addition, the chest walls compliance of infants are more than that of adults, with stiffening starting in the after first year of life and after 2 years of life ,the

lung and chest wall compliance are nearly equivalent to that observed in adults. [64] Hence most of the pediatric and neonatal mechanical ventilation guidelines have been arbitrarily extrapolated from adult guidelines, without keeping in mind the vital differences in lung pathology, response mechanisms to injury, and co-morbidities among these categories. In the last decade, significant advances have been made in the treatment and management of pediatric respiratory failure. The choices made in the mechanical ventilation strategies can make a significant change in the chances of subsequent ventilator associated lung injuries. Mechanical ventilation is no longer considered as a harmless support modality which is used as a remedy to keep the patients alive while disease-specific medications are being used to annihilate the pathology. [65] Unsuitable ventilator settings, noncompliance to protective ventilation strategies, and lack of patient monitoring during invasive ventilation can also expose the children to added risks [66] One of the lifesaving interventions for patients in respiratory failure is Invasive mechanical ventilation. The most frequently used modes of ventilation are assist-control, pressure support ventilation and synchronized intermittent mandatory ventilation. When used as a diagnostic modality, the ventilator has the capacity to provide the value of static compliance of the respiratory system and airway resistance. The clinical picture and the information derived from the mechanical ventilator allows the physician to provide safe and effective invasive mechanical ventilation via adjustment of the ventilator settings. While a ventilator is considered to be lifesaving modality, it can sometimes be toxic therefore it must be withdrawn clinically indicated. [67]

Evaluating respiratory mechanics like compliance and resistance, based upon the curves, ventilatory graphs, and absolute values, can potentially guide the clinician regarding the invasive ventilatory strategies needed for the various groups of respiratory diseases. [68] The elucidation of curves displayed on many ventilators can guide the clinician regarding the

pathophysiology of the diseases and their interaction and relation to MV variables (pressures, volume, and flow) [69] Real-time graphics allow breath-to-breath evaluation of respiratory mechanics and the dynamic patient-ventilator interaction. It allows the intensivist to modify ventilatory settings based upon the pathophysiology and patient's response and may help in the detection of obstacles before they become clinically apparent. Graphics also provide information about the efficacy of pharmacologic agents administered and their response on the patients over time. [70]

The optimal ventilatory strategies in ARDS are still being formulated as the "adult" ventilatory strategies have not been tested on pediatric population in randomized control trials ([71,72,73] and definitive association between the use of high tidal volume and mortality has not been elicited. [74]

Oxygenation and respiratory mechanics are interlinked, as changes made to the ventilator affect both oxygenation and pressure simultaneously. Therefore, it is difficult to come to a conclusion that which of the variables, pressure or oxygenation, is significantly associated with mortality. In a study conducted by Nadir Yehya and Neal J. Thomas concluded that out of oxygenation and respiratory mechanics, improvement in oxygenation was associated with a significantly lower mortality in pediatric ARDS. They further stated that ventilation in pediatric population should aim for a higher oxygenation response i.e. higher PaO_2/FIO_2 rather than a lower PIP or driving pressure, as oxygenation had a more consistent relation to mortality, and is thus a reliable marker. [75]

In contrast another study conducted to looks for potentially modifiable factors instrumental to outcome in acute respiratory distress syndrome stated that lower peak, plateau, lower driving pressures, along with a higher PEEP and lesser respiratory rate were independently associated with improved outcome in ARDS. [76]

An article published in American journal of respiratory and critical care medicine stated that clinical trials aimed at targeting PEEP management in ARDS were needed as it has been observed that patients treated with

lesser values of PEEP had higher mortality rate than those who were treated with a PEEP values in accordance with or higher than what has been recommended by ARDSNet model .Even after making adjustments for severity of illness, ventilator requirements , hypoxemia, inotropes, comorbidities, nitric oxide, and dataset, lower PEEP than the recommended values as per protocol continued to be an independent risk factor for higher mortality .[77]

Similarly, another study done by Laffey JG opinionated that airway pressures and tidal volume normalized to body weight are meagre markers to stratify the lung stress and strain in mild pediatric ARDS. [78]

Limited information is available on respiratory mechanics in pediatric population with ARDS. Thus, identifying the changes in respiratory mechanics could provide imperative data on the possible harmful effects of invasive ventilation in children with ARDS. [79,80]

According to another study by Pérez M, Mancebo J, monitoring respiratory tract's the mechanics (both static and dynamic) is absolutely needed for monitoring the diagnosis and prognosis of the disease condition and to make important therapeutic decisions. These measurements also help in maintaining the lung functions in ideal condition during mechanical ventilation and help the clinician to choose the best time to disconnect the patient. [81]

Another study by Cruces P stated that interpretation of respiratory mechanics of infants and children with severe bronchiolitis requiring MV suggests that the elastic constituent of the working pressure of respiratory tract is one the most important parameter. The elastic and resistive components in addition to flow profile are representative of restrictive diseases therefore a deeper knowledge of lung mechanics in these of patients may lead to a change in the conventional approach to ventilation in severe bronchiolitis. [82]

Easy access to respiratory mechanics like compliance, ventilation / perfusion mismatches and lung volumes could potentially improve the

management of ventilated patients and in addition can reduce the chances of lung injury. There are many proven methods for measurement of respiratory function in infants and children, but only a handful of data is available on the clinical ease and the application of above-mentioned tests in the pediatric and neonatal intensive care unit (PICU, NICU). [83]

Julia study concluded that a better knowledge of the doctrines behind neonatal ventilation is needed so that clinicians taking care of the sick newborns have the necessary guidelines to provide the best care possible to the infant. Given the wide range of modes and parameters available on ventilator better clarification and guidelines are needed to allow for safe ventilation. Many variables can influence the clinical decision of the intensivist based on both the individual choice and the wider perspective of neonatal care. [84]

Study done on severe respiratory failure due to coronavirus disease 2019 pneumonia (COVID-19) which was nonresponsive to non-invasive ventilation and needed invasive mechanical ventilation further proved that although ventilator is a life-saving modality, it can cause further add to lung injury if airway pressure and flow and their timing are not adjusted to the respiratory mechanics of the individual patient. [85]

Silva PL, Rocco PR reached the conclusion that mechanical ventilation is a life-support used to maintain lung function needed for survival in patients who are either critically ill or requiring general anesthesia and the boons and bane of mechanical ventilation in terminally ill patients with underlying injured or disease free lungs, as well as in patients undergoing procedure under general anesthesia, depend not only on settings of the ventilator, but also on the understating and interpretation of these ventilator-derived parameters. Both these ventilatory parameters and ventilator-derived parameters need to be strictly observed, to inculcate a case-by-case approach to mechanical ventilation. Furthermore, additional trials are needed to confirm the safe values of all of these parameters in injured and uninjured lungs. [86]

Multiple studies have concluded that randomized controlled trails are needed to determine whether routine measurements of respiratory mechanics improve the efficacy of treatment and mortality in children receiving mechanical ventilation. [87,88,89]

In a study conducted by Gopinathannair Harikumar, Anne Greenough and Gerrard F Rafferty, the role of respiratory mechanics in predicting the successful weaning and extubation is limited , but respiratory system compliance and resistance give data regarding the underlying lung pathology and the burden they impose on the respiratory muscles. [90]

Measurement of respiratory mechanics in children on MV, could provide potentially valuable information about the pathophysiological status of the underlying lungs, disease progression and its response to treatment interventions. [91]

Another study addresses the need for more studies in pediatric ventilation and states that Pediatric practitioners are facing an exceptional trial when attempting to decipher the adult mechanical ventilation practices and guidelines for acute lung injury or ARDS into pediatric guidelines and practice. [92]

Study conducted by European Society of Pediatric and Neonatal Intensive Care revealed that there is gross irregularity in both the mechanical ventilation practice and use of treatment therapies in children of acute lung injury. Pediatric trials for formulation of guidelines are needed to generate enough evidence to optimize the outcome of the patients. They also estimated that many centers will need to conduct such trials; therefore, international collaboration and participation will be needed. [93]

Despite the improvements recorded in the treatment of pediatric ARDS in the last decades and the sudden boom in the innovative modes of mechanical ventilation, there is a scarcity of well-defined and constant guidelines regarding invasive ventilation available for children. In many arenas data is either completely lacking or it has been derived from

studies performed in adults. Therefore, it is imperative to obtain studies specific to the pediatric population to come to a consensus. [94]

Another research stated that one the most important cause of morbidity and mortality in pediatrics is pediatric acute respiratory distress syndrome with mortality rates of approximately 50% in children with severe PARDS. Despite these figures, pediatric lung injury and mechanical ventilation is an area that has been poorly explored with majority of evidence being either observational or retrospective and only a handful of them being randomized controlled trials to guide intensivists. The most recent internationally accepted guidelines for pediatric lung injury are also based on an agreement rather than any objective data. Therefore, most of the pediatric mechanical ventilatory practices have been randomly extrapolated from adult protocols, neglecting the distinct differences in the basic lung pathology, reaction to injury, and co-morbidities between these two. Low volume ventilation is usually considered acceptable in pediatric patients, even in the absence of clear evidence. None of the target tidal volume range has steadily been related to outcomes. Similarly, the concept of optimal PEEP has not been explored. There is a general acceptance that pediatric population requires a higher $FiO_{2,}$ and lower PEEP as compared to adults. Other newer modes of ventilation like airway pressure release ventilation and high frequency ventilation have not been explored in a systematic manner in pediatrics and there is a scarcity of evidence to either support or dissuade its use. There is a lack of consistency in outcomes among studies done to determine the optimal modes or methods of ventilatory settings. There is not a single optimal approach to mechanical ventilation. [95]

Eduardo Antonio Faustino in his review stated that parameters of resistance, pulmonary compliance and intrinsic PEEP are essential to comprehend the acute respiratory failure and mechanic ventilatory support, mainly in acute respiratory distress syndrome (ARDS). Respiratory mechanic physiology remains an essential modality to make

decisions and for the effective management of modern ventilators. Assessment of pulmonary mechanic parameters as a guiding tool has been recommended by many review articles and clinical research. [96]

In a study by Eric J Seeley, decreased respiratory system compliance can indicate persistent pulmonary, atelectasis of inflamed lung, chest wall edema, or evidence of fibroproliferative phase of ALI. If these findings can be simulated in a larger population, then decreasing respiratory compliance, interpreted with respect to other known predictors of mortality, may help in identifying the patients with higher risk of mortality from ALI at the time of the subacute phase of illness [97]

MATERIAL AND METHOD

This was a prospective, non-interventional, observation study conducted in the Pediatric Intensive Care Unit of a tertiary care hospital, DMCH Ludhiana between July 1, 2022, to September 30, 2023.

7.1 Source of Data:

Source of data was all Pediatric patients (1 month-18 years) requiring Mechanical ventilatory support for more than 24 hours in the Pediatric ICU, DMCH, Ludhiana.

7.2 METHOD OF COLLECTION OF DATA

It was an observational study conducted over a period of 15 months from July 1,2023 to September 30, 2023. This study was approved by the institutional Ethics committee.

Inclusion Criteria:

- For 15 months, pediatric patients (1 month-18 years) admitted to the PICU with clinical diagnosis of Respiratory failure and requiring MV support for >24 hours were included in the study.

Exclusion Criteria:

- Those requiring ventilator for less than 24 hours and in scenarios where the inspiratory pause was not possible due to spontaneous breathing were excluded from this study.

The following data was compiled as shown in Performa.

- Demographic details
- Vital signs
- Examination findings
- Anthropometric indices
- Primary diagnosis made by clinicians.
- Need for oxygen support.
- need for ventilator.
- Inotropes requirement
- Laboratory findings

- Outcome- discharge/shifted/death or DAMA (discharge against medical advice)

ANALYTICAL FRAMEWORK

A. Method of collection of data [98]: At the time of admission, demographic data along with diagnosis and vital signs are recorded.

Assessment of clinical status was done in all the cases and recorded as per PALS guidelines as below.

a. Airway

Table 1: Airway Identification [98]

Airway Identification	Features
Stable	clear, no obstruction to the flow of air, no noisy breathing
Maintainable / Unstable	may require positioning and/ or suctioning of secretions
Non-Maintainable/Obstructed	require advanced airway adjuvants

B. BREATHING

1. Respiratory Rate

Table 2: Respiratory rates (Breaths/ minute) at different ages [98]

Age	breaths per minute
Infant (less than one year of each)	30 – 53
Toddler (1-3 years)	22 – 37
Pre School (4-5 years)	20 – 28
School Age (6-12 years)	18 – 25
Adolescent (1 3-18 years)	12 - 20

Tachypnea: It is defined as respiratory rate more than normal for age.

Bradypnea: Breathing rate less than 10 per minute at any age is considered abnormal.

Apnea: Cessation of breathing for 20 seconds or longer or earlier if associated with cyanosis, bradycardia, pallor and / or hypotonia.

2. Work of breathing

When tachypnea alone fails to meet the oxygen demand of the body accessory muscles of respiration work hard to increase the air flow of the lungs

Accessory muscles like alae nasi, suprasternal, supraclavicular, intercostal, subcostal muscles were assessed as: nasal flaring, subcostal and intercostal retractions, head bobbing.

3. Auscultation

Lung sounds were assessed to get information regarding the air entry into the lungs.

Table 3: Various lung sounds and their representation [98]

Sounds	**Interpretation**
Stridor	upper airway obstruction
Wheeze	lower airway obstruction
Expiratory grunting	alveolar atelectasis or edema
Inspiratory crackles	Fluid/mucus/blood in lungs
Unilateral absent breath	plural fluid, consolidation, or pneumothorax

4. Oxygen Saturation

- It is the percentage of the child's hemoglobin that is saturated with oxygen.
- Normal SpO2 is 94% or more on room air.

C. CIRCULATION

1. Rate and Rhythm

Table 4: Heart Rate(beats/min) at different ages [98]

Age	Awake Heart rate	sleeping heart rate
Neonate	100 -205	90-160
Infant (<1 year)	100-180	90-160
Toddler (1-3 years)	98-140	80-120
Preschool (4-5 years)	80-120	65-100
School age (6-12 years)	75-118	58-90
Adolescent (13-18 years)	60-100	50-90

2. Central and Peripheral Pulses:

Central pulses were palpated in neck carotids, brachial or femoral arteries. Peripheral pulses evaluated were radial, dorsalis pedis or posterior tibial arteries.

3. Capillary refill time (CRT/CFT):

CFT was evaluated by applying pressure over the nail bed or the skin and blanching the underline capillary circulation. Normally CFT is 2-3 seconds. Prolonged CFT is suggestive of insufficient circulation and brisk CFT is suggestive of septic shock due to underlying vasodilation.

4. Blood Pressure

Appropriate size cuff covering at least half the arm length between acromion and olecranon process ensuring that cuff wraps around 70 to 80% off mid arm circumference were used.

Table 5: Hypotension cut off according to age [98]

Age	Formula (Systolic BP)
Term Neonate (28 days)	<60 mm Hg
Up to 1 year	<70 mm Hg
1-10 years	70 + Age(years) X 2
10 years	<90

d. Disability:

The neurological parameter was assessed by Glasgow coma scale (GCS):

Components of GCS score

Eye Response Range 1-4

Verbal Response 1-5

Motor Response 1-6

Table 6: Glasgow coma scale [99]

Modified Glasgow Coma Scale			
Eye Opening	Score	Child	Infant
	4	Spontaneous	Spontaneous
	3	To Sound	To Sound
	2	To Pain	To Pain
	1	None	None
Verbal	5	Oriented	Coos/ Babbles
	4	Confused	Irritable Cry
	3	Inappropriate Words	Cries to pain
	2	Incomprehensive Sounds	Moans to pain
	1	None	None
Motor	6	Obeys Commands	Spontaneous
	5	Localizes pain	Withdraws to touch
	4	Withdraws to pain	Withdraws to pain
	3	Decorticate Flexion	Decorticate Flexion
	2	Decerebrate Extension	Decerebrate Extension
	1	None	None

- To standardize the measurements, compliance was evaluated from the second day after 24 hours of ventilation. The measurements were not performed on the first day on mechanical ventilation because of the

changes and adjustments that are usually required in the first 24 hours of MV support. Values were taken by pressing the inspiratory pause which is situated on ventilatory panel. All the parameters on ventilator and compliance were noted by inspiratory hold twice a day. The outcome variables like Peak inspiratory pressure (PIP), Mean airway pressure (MAP), Positive end expiratory pressure (PEEP), Tidal volume (TV) and Compliance were also recorded. Mechanical ventilation support was provided with the Nellcor Puritan Bennett 840 Ventilator system.

- ARDS was classified as per the Berlin classification. [100]

Table 7: Berlins definition and criteria for ARDS

Timing	Within a week of a known clinical insult or new or worsening respiratory distress
Chest imaging	Bilateral opacities- not fully explained by effusions, lobar/collapse, or nodules
Origin of edema	Respiratory failure not fully explained by cardiac failure or fluid overload. Need objective assessment (e.g.) echocardiography to exclude hydrostatic edema if no risk factor presents
Oxygenation	
Mild	200 mm Hg $<PaO_2/Fio_2 \leq 300$ mm Hg with PEEP or CPAP≥5cm of H_2O
moderate	100 mm Hg $<PaO_2/Fio_2 \leq 200$mm Hg with PEEP ≥5cm of H_2O
Severe	$PaO_2/Fio_2 \leq 100$mm Hg with PEEP ≥5cm of H_2O

- Classification of Ventilator acquired pneumonia and hospital acquired infections were done as per the latest CDC guidelines.
- Pediatrics risk of Mortality (PRISM) score was also calculated for all the patients. The score was calculated in all the patients at the time of admission. This score includes 14 variables like GCS, Pupillary Reactions, Systolic blood pressure, diastolic blood pressure, heart rate, respiratory rate, PaCO2, paO2/FiO2, coagulation profile, glucose, Potassium, Total bilirubin, calcium, bicarbonate.

- Blood sample form the patient enrolled in the study was used to get data regarding the complete blood count, renal and liver function.
- Oxygen saturation index (OSI) calculated as [101]

Mean airway pressure (MAP) x FiO_2 /SpO_2

Table 8: Oxygen saturation index

Oxygen saturation index (OSI)	**Classification**
5 ≤ OSI < 7.5	Mild
7.5 ≤ OSI < 12.3	Moderate
≥ 12.3	Severe

- Sequential organ failure assessment score (SOFA score), score was calculated at the time of admission. This score is calculated as follow:

Table 9: Sequential Organ Failure assessment (SOFA) score [102]

	Central nervous system	Cardiovascular system	Respiratory system	Coagulation	Liver	Renal function
Score	Glasgow coma scale	Mean arterial pressure OR administration of vasopressors required	PaO_2/FiO_2 [mmHg (kPa)]	Platelets ($\times 10^3/\mu l$)	Bilirubin (mg/dl)	Creatinine (mg/dl)
+0	15	MAP ≥ 70 mmHg	≥ 400	≥ 150	< 1.2	< 1.2
+1	13–14	MAP < 70 mmHg	< 400	< 150	1.2–1.9	1.2–1.9
+2	10–12	dopamine ≤ 5 µg/kg/min or dobutamine (any dose)	< 300	< 100	2.0–5.9	2.0–3.4
+3	6–9	dopamine > 5 µg/kg/min OR epinephrine ≤ 0.1 µg/kg/min OR norepinephrine ≤ 0.1 µg/kg/min	< 200 and mechanically ventilated including CPAP	< 50	6.0–11.9	3.5–4.9
+4	< 6	dopamine > 15 µg/kg/min OR epinephrine > 0.1 µg/kg/min OR norepinephrine > 0.1 µg/kg/min	< 100 and mechanically ventilated including CPAP	< 20	> 12.0	> 5.0

Statistical Analysis:

Data were described in terms of range; mean ±standard deviation (± SD), median (IQR), frequencies (number of cases) and relative frequencies (percentages) as appropriate. To determine whether the data was normally distributed, a Kolmogorov-Smirnov test was used. Comparison of quantitative variables between the study groups was done using Mann Whitney U test and Kruskal-Wallis Test for non-parametric data. Comparison of quantitative variables was done using Wilcoxon rank test. For comparing categorical data, Chi square ($\chi 2$) test was performed, and fisher exact test was used when the expected frequency is less than 5. Covariates obtaining a P value <0.05 in the univariate analyses were included in the multivariate Binary logistic regression analyses. GLM regression analysis was done to find the predictor of C static. A probability value (p value) less than 0.05 was considered statistically significant. All statistical calculations were done using (Statistical Package for the Social Science) SPSS 21.0 version (SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows.

OBSERVATIONS AND RESULTS

- It was a prospective observational study of 1 year 3 months duration (July 1,2023 to September 30, 2023) conducted on children admitted to the Pediatric Intensive Care Unit (PICU) of a tertiary care multi-speciality teaching hospital (DMCH, Ludhiana). Critically sick patients admitted to the PICU with clinical diagnosis of Respiratory failure and requiring Mechanical ventilation support for more than 24 hours were included to study compliance of lungs in children on mechanical ventilator and correlate compliance with mortality, duration of PICU stay and Duration of ventilation.
- During the duration of study, i.e. from July 1,2022 to September 30, 2023, a total of 740 patients were admitted to PICU out of which 146 patients needed mechanical ventilation due to various causes. Thirty-two patients were excluded from the study as 12 of them were neonates,11 required ventilatory support for less than 24 hours and in rest of the 9 patients, the inspiratory pause was not possible due to spontaneous breathing and hence compliance could not be noted.

SECTION: 1

A. DEMOGRAPHIC AND CLINICAL CHARACTERISTICS OF SUBJECTS:

AGE

All patients between the age group of 1month to 18 years of age admitted to pediatric ICU were included in the study. All children except for neonates who successfully met the other inclusion criteria were included into the study. The age distribution of subjects in the study group was as follows:

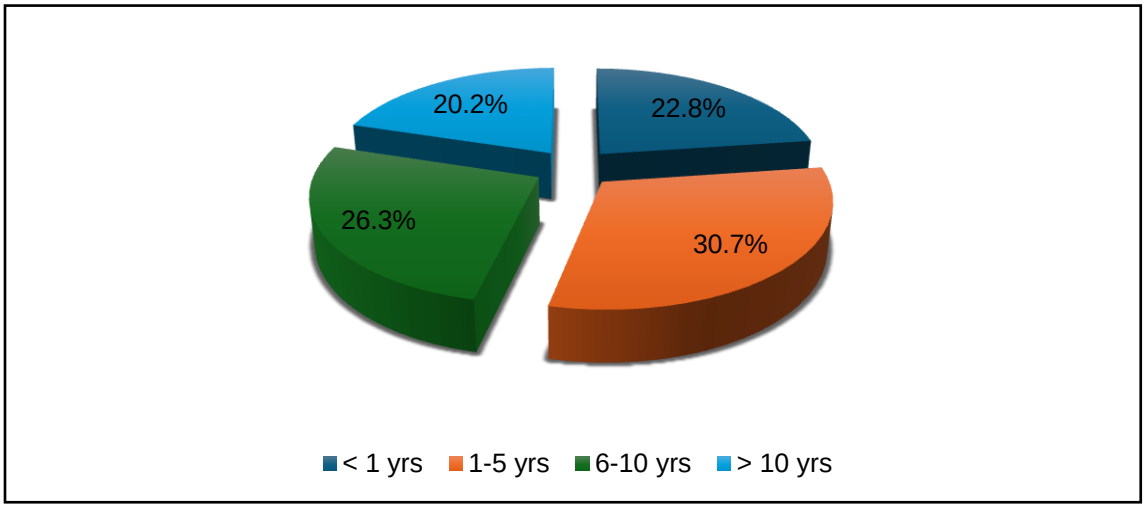
Table 10: Age distribution of the subjects

n=114

Age group	No. of cases	Percentage
1month- 1 yr.	26	22.8%
1-5 yrs.	35	30.7%
6-10 yrs.	30	26.3%
More than 10 yrs.	23	20.2%
Total	114	100.0%

As shown in table 10, in our study, out of total 114 subjects, thirty-five (30.7%) were between 1 to 5 years of age, 23(20.2%) subjects aged more than 10 years. Thirty (26.3%) were between 6-10 years of age, twenty-six subjects (22.8%) were less than 1 year of age. Thus, maximum subjects were in the age group of 1-5 years of age. The youngest subject was 1 month, and the eldest one was 16 years of age. Mean age of the subjects was 5.86±4.77 years and median age was 5 years (IR 1.56-9.52 years)

FIGURE1: Age wise distribution of the subject



GENDER DISTRIBUTION

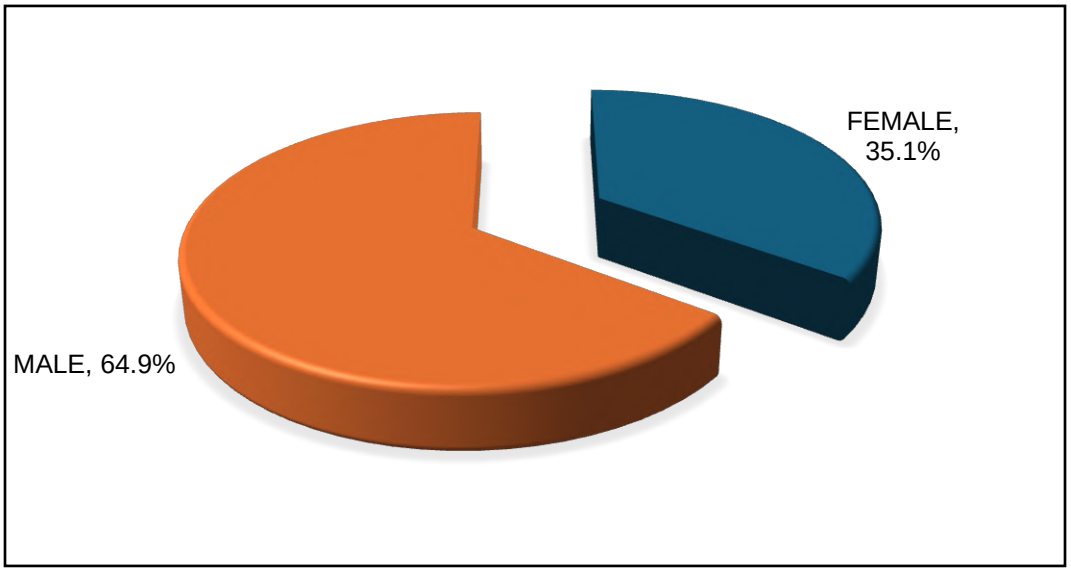
Table 11: Gender distribution of the study group

n=114

Gender	No. of cases	Percentage
FEMALE	40	35.1%
MALE	74	64.9%
Total	114	100.0%

As shown in table 11, in our study group, out of total subjects, forty (35.1%) were female and remaining 74 (64.9%) were male making a total of 114. Male to female ratio was 1.85:1.

Figure 2: Gender distribution of the study population



PRIMARY SYSTEM INVOLVED

Subjects were divided into various subcategories based on the primary system involved.

Table 12: Distribution of subjects as per primary system involved.

n=114

SYSTEM	NO. OF SUBJECTS	PERCENTAGE (%)
RESPIRATORY	36	31.5
CENTRAL NERVOUS SYSTEM	27	23.6
GASTROINTESTINAL	13	11.4
TRAUMA	13	11.4
CARDIOVASCULAR SYSTEM	5	4.3
NEUROMUSCULAR	5	4.3
INFECTIONS	4	3.5
SURGICAL	3	2.6
ONCOLOGY	2	1.7
POISONING	2	1.7
RENAL	2	1.7
ENDOCRINE	1	0.8
HEMATOLOGY	1	0.8
Total	114	100

As shown in table 12, in our study group, thirty-six (31.5%) cases of respiratory system were admitted with spectrum of diagnosis varying from 28 cases of acute respiratory distress syndrome to 6 cases of pneumonia to 2 cases of Bronchial Asthma. Twenty Seven (23.6%) patients with primary Central nervous system involvement were seen with diagnosis varying from 6 cases of meningitis to 14 cases of meningoencephalitis ,4 cases of seizure disorder, one case of cerebral venous thrombosis,1 case of MRSA brain abscess and 1 case of communicating hydrocephalous. In gastrointestinal system, 13(11.4%) patients were admitted, diagnosis included acute diarrheal disease with severe dehydration [(3)] and Acute

liver failure (10). Thirteen (11.4%) patients were admitted with Roadside accident leading to polytrauma but primarily intubated due to traumatic brain injury. Five (4.3%) of patients were admitted with the involvement of cardiovascular system with diagnosis of Myocarditis [2] and Congestive cardiac failure. [3] Guillain-Barre syndrome, a neuromuscular disorder was the primary diagnosis of 5 (4.3%) of the cases. Four (3.5%) of the patients were admitted with infections (dengue and sepsis). Three (2.6%) of the patients were admitted with surgical emergencies post exploration (Congenital hypertrophic pyloric stenosis, intestinal perforation, and inguinal hernia). One patient of Wilms tumor and one case of Acute lymphocytic leukemia also required ventilatory support. Two (1.7%) cases of poisoning were admitted (Organophosphate and neuromuscular snake poison). Two (1.7%) cases of renal system (chronic kidney disease and Acute kidney injury) involvement were admitted.

Figure 3: Primary system involvement

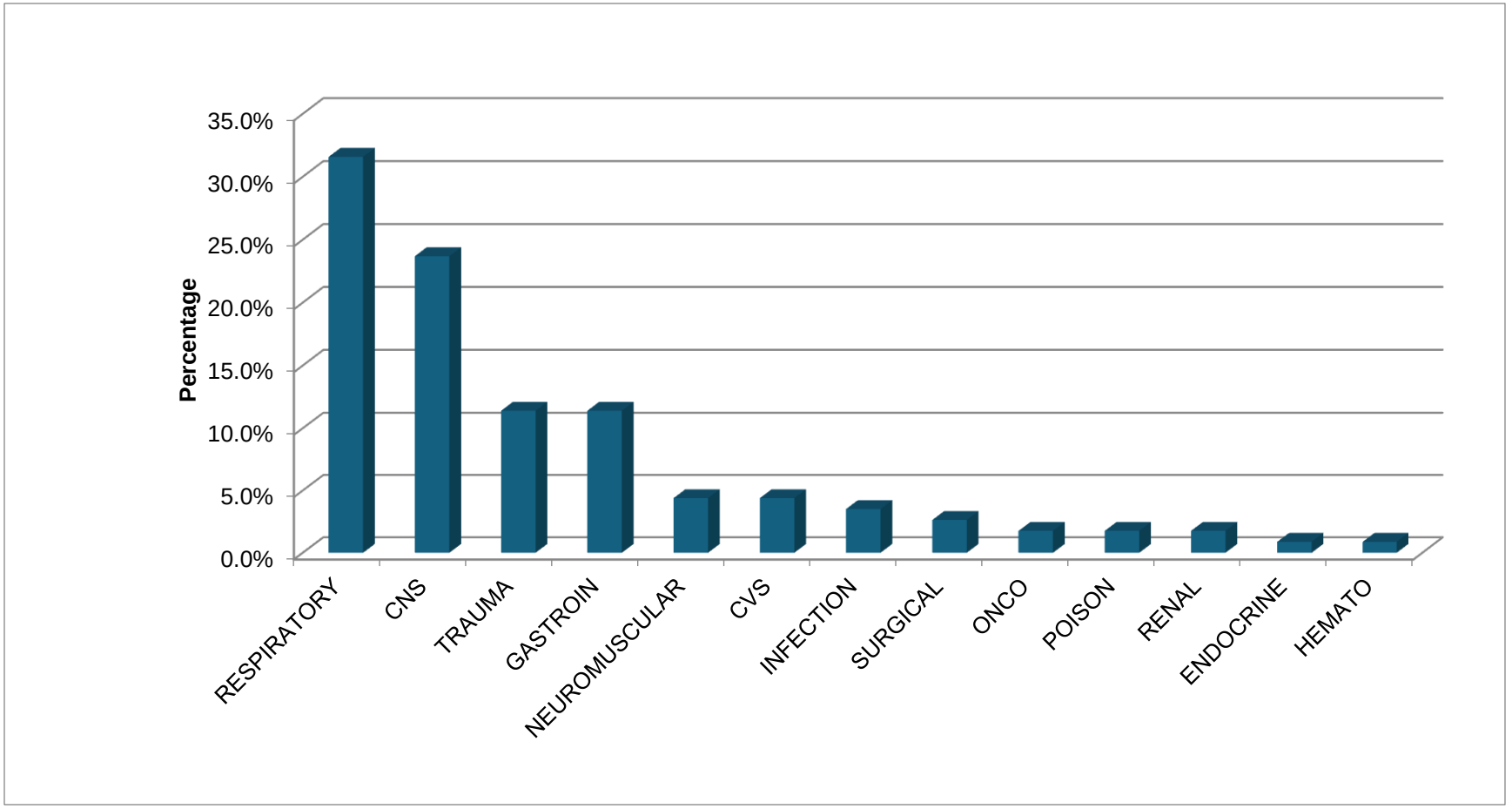


TABLE 13: Complications during PICU stay

COMPLICATION	FREQUENCY	PERCENT
BLOOD CULTURE	1	12.5
STOOL CULTURE	1	12.5
VAP	6	75
Total	8	100

As shown in table 13, out of 114 patients on ventilatory support during the duration of study, 6 of them developed Ventilator associated pneumonia. Organisms isolated from the endotracheal secretions were Klebsiella, Acinetobacter, pseudomonas staphylococcus, Enterobacter. One stool and blood culture came out to be positive for Clostridium difficle and Acinetobacter respectively.

TABLE 14: Inotropic support

INOTROPES	NO. OF CASES	PERCENTAGE
NO	83	72.8%
YES	31	27.2%
TOTAL	114	100.0%

Table number 14 shows that out of 114 patients ,83(72.8%) required no inotropes during the duration of PICU stay. Thirty-one (27.2%) of the patients required inotropic support. Sixteen (51.6%) patients required norepinephrine. Ten (32.2%) patients needed both epinephrine and norepinephrine. The rest of the 5(16.2%) patients required dobutamine in combination with either epinephrine or norepinephrine.

Table 15: Prism score

PRISM GROUP	Frequency	Percent
< 10	19	16.7%
> 10	95	83.3%
Total	114	100.0%

Pediatric risk of mortality (PRISM) is one of scores used in pediatric intensive care unit to predict that chances of mortality in a sick patient. The score was calculated in all the patients at the time of admission. This score includes 14 variables like GCS, Pupillary Reactions, Systolic blood pressure, diastolic blood pressure, heart rate, respiratory rate, PaCO2, paO2/FiO2, coagulation profile, glucose, Potassium, Total bilirubin, calcium, bicarbonate. The higher the score higher is the risk of mortality.

As per table number 15, 19(16.7%) of the patients had a prism score of less than ten. Ninety-five (95%) of the patients had a prism score of more than ten. Mean PRISM score is 22.90 ±9.85. Median PRISM came out to be 25 (IR15-30). Minimum PRISM was 4. Maximum PRISM was 40.

Table 16 : SOFA score

SOFA GROUP	Frequency	Percent
< 10	97	89.8%
> 10	17	15.7%
Total	114	100.0%

Sequential Organ Failure assessment (SOFA) is a commonly used scoring system in pediatrics. SOFA assesses the performance of several organ systems and hemodynamics and assign a score based on the information obtained in each category. Score ranges from 0(best) to 24(worst)

As per table 16, 97 (89.9%) of the patients had a SOFA score of less than ten. Seventeen (15.7%) of the patients had a SOFA score of more than ten. Mean SOFA score was 4.89±3.56. Median SOFA score came out to be 4(IR 2-7). Minimum SOFA score was 0 and maximum SOFA score was 13.

TABLE 17: Duration of ventilation in patients

VENTILATION DAYS	NO. OF CASES	PERCENTAGE
< 3	12	10.5%
3-7	40	35.1%
> 7	62	54.4%
TOTAL	114	100.0%

As shown in table number 17, twelve (10.5%) patients needed ventilator for less than 3 days. Forty (35.1%) of the patients stayed on ventilator for 3-7days. Sixty-two (54.4%) out of 114 patients needed ventilator for more than 7 days. Max duration of stay on ventilator was for 38 days and minimum duration of stay on ventilator was for 2 days. Most of the patient required ventilatory support for greater than 7 days. Mean ventilatory stay was 9.11±6.48 days and median stay was for 7(IR 5-11) days.

Figure 4: Duration of ventilation in patients

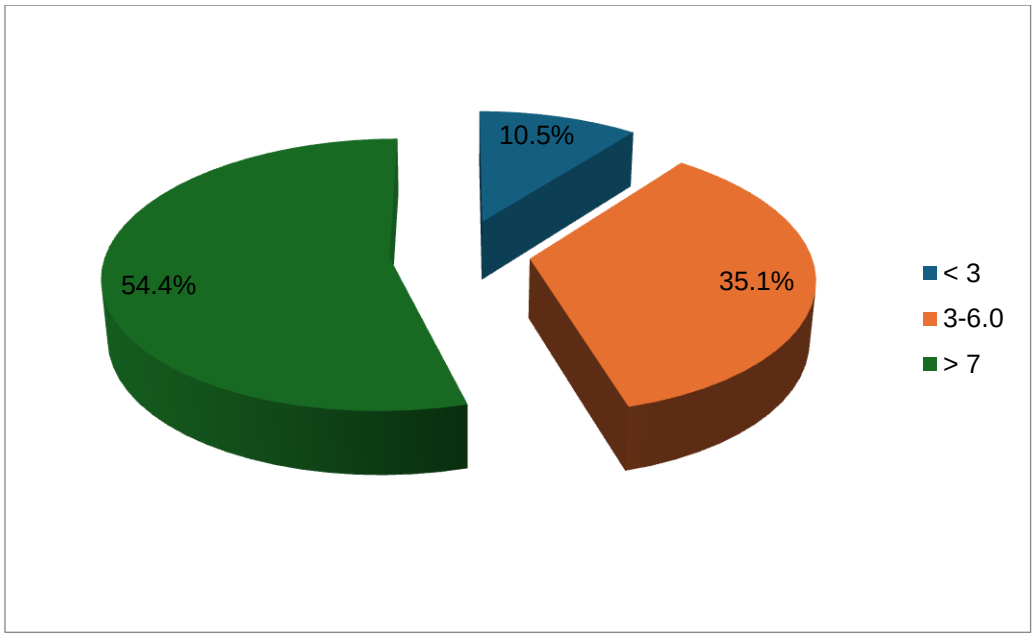
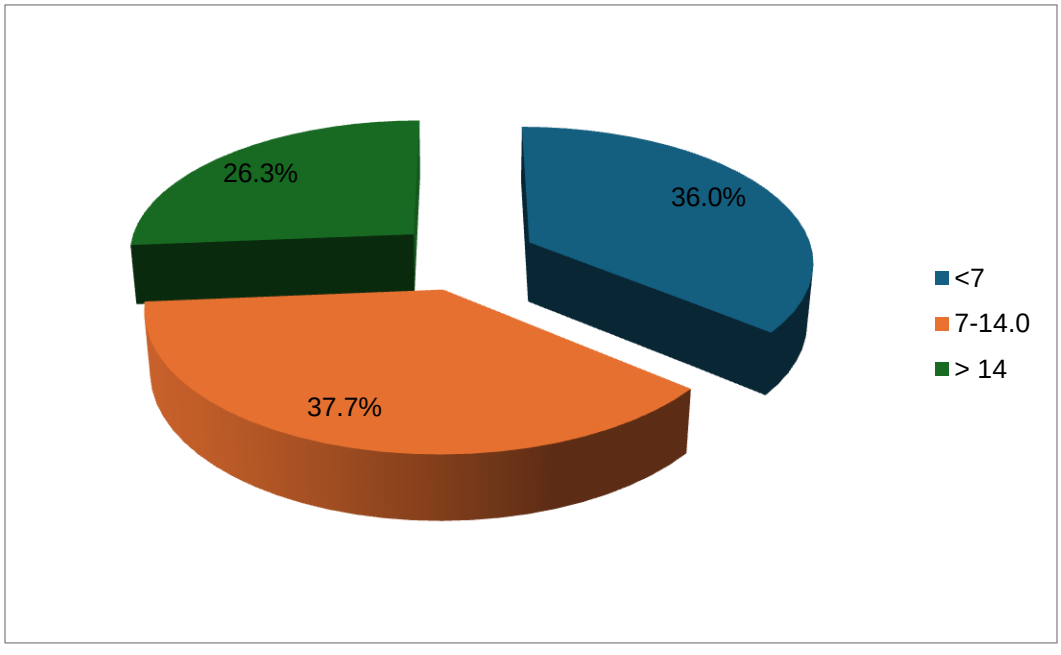


TABLE 18: Duration of PICU stay in patients

PICU STAY(DAYS)	No. of cases	Percentage
<7	41	36.0%
7-14.0	43	37.7%
> 14	30	26.3%
Total	114	100.0%

As displayed in table number 18, 40(36%) of the patients stayed in PICU for less than 7 days, Forty three (37.7%) of the patients stayed in PICU for 7-14 days. Thirty (26.3%) of the patients had a prolonged duration of stay for greater than 14 days. Longest stay was for 51 days, and shortest stay was of 2 days. Most of the patients stayed in the PICU for 7-14 days. Mean PICU stay was 12.12± 8.74 days and median stay was 9 (IR 6-15) days.

Figure 5: Duration of PICU stay



OUTCOME

Table 19: Outcome of subjects included in study

OUTCOME OF THE SUBJECT	NUMBER	PERCENTAGE (%)
DISCHARGE	76	66.6
DISCHARGE AGAINST MEDICAL ADVICE	18	15.8
DIED	20	17.6
TOTAL	**114**	**100**

As shown in table 19, seventy-six (66.6%) were discharged and 20(17.6%) of the patients died in the PICU during the duration of study. Eighteen (15.8%) out of 114 took discharge against medical advice and most of them took DAMA because of the financial burden of expensive medical treatment followed by poor neurological outcome of the patient.

Figure 6:Outcome of the subjects

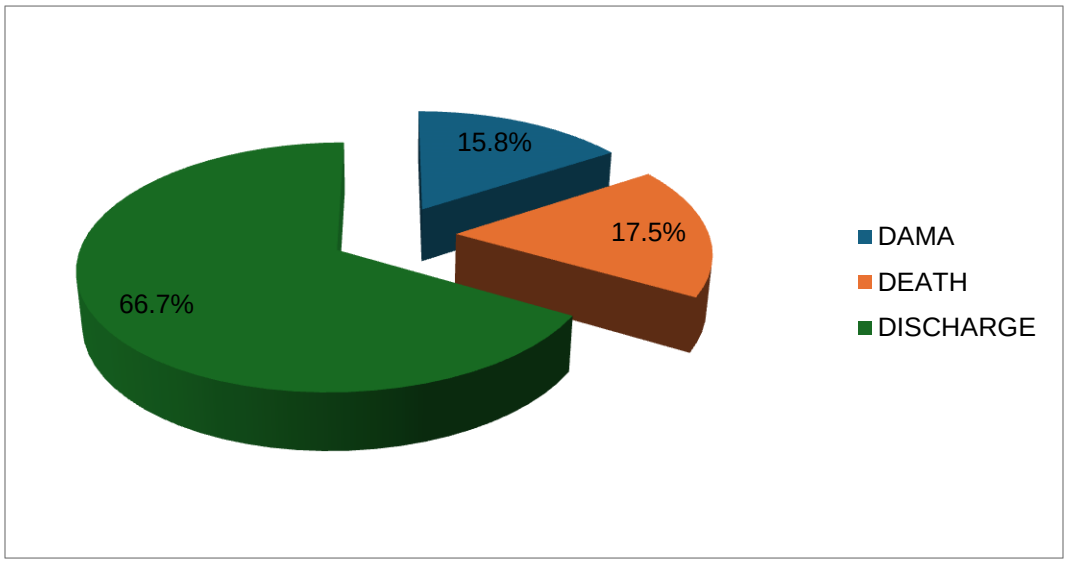


Table 20: Number of patients with primary diagnosis as acute respiratory distress syndrome (ARDS)

ARDS CLASSIFICATION	NO OF PATIENTS	PERCENT
MILD	5	17.9
MODERATE	4	14.3
SEVERE	19	67.9
TOTAL	**28**	**100**

As shown in table 20, Total 28 patient were admitted with primary diagnosis as ARDS during the duration of study. According to Berlin's criteria five (17.9%) of them were classified as mild ARDS. Four (14.3%) were classified as moderate ARDS and 19(67.9%) were cases of Severe ARDS

Table 21: Outcome of patients with primary diagnosis as ARDS

ARDS CLASSIFIACTION	TOTAL	**DISCHARGE**	**DAMA**	**DEATH**
MILD	5	**4(80%%)**	**0(0%)**	**1(20%)**
MODERATE	4	**2(50%)**	**2(50%)**	**0(0%)**
SEVERE	19	12(63.2%)	2(10.5%)	5(26.3%)
TOTAL	28	18(64.2%)	4(14.2%)	6(21.%)

As shown in table 21, out of 5 patients with mild ARDS, four were discharged and there was 1 mortality. Out of 4 with moderate ARDS, two patients were discharged and 2 took discharge against medical advice. Nineteen patients had severe ARDs out which 12 were discharged, 6 died and 2 took discharge against medical advice.

SECTION II:

The values of compliance were taken by pressing the inspiratory pause which is situated on ventilatory panel. The measurements were not performed on the first day of mechanical ventilator because of the changes and adjustments that are usually required in the first 24 hours of Mechanical ventilatory support. Compliance was recorded every day after 24 hours till the last day of ventilation. Compliance put in simple words is the measure of distensibility of the lungs. Static compliance (CSTAT) is the ratio between the change in volume (Inspiratory tidal) and the corresponding change in transmural pressure (ΔP). Hammer defined normal value of Respiratory compliance as 1±0.04 ml/kg/ H_2O [(103)]

TABLE 22: Average compliance on day 2 of ventilatory support and on the last day of ventilation

	Mean	Std. Deviation	Minimum	**Median**	IQR	Z score	P value
First CS/KG	0.75	0.37	0.08	0.71	0.49-1	-2.709	0.07
Last CS/KG	0.81	0.42	0.05	0.75	0.53-1.07		
Difference	0.05	0.34	-1.29	0.02	-0.252		
Percentage change	-14.70	108.61	-900.00	3.99	-38.22		

As shown in table 22, mean compliance on day 2 of ventilation was 0.75±0.37 ml/kg/H_2O with maximum value of compliance observed during the study being 1.83 ml/kg/H2O and minimum value compliance recorded during the study being 0.08 ml/kg/H_2O on day 2 of ventilation. Median value of compliance was 0.71 ml/kg/H_2O (IR0.49-1)

Mean compliance on the last day of ventilation was 0.81±0.42 ml/kg/H_2O with maximum value of compliance observed being 2.06 ml/kg/H_2O and minimum value being 0.05 ml/kg/H_2O on the last day of ventilation. Median value of last compliance was 0.75 ml/kg/H_2O(IR0.53-1.04). There was a statistical significance (p value 0.007) between these two values i.e. admission and discharge compliance.

Table 23: Gender wise distribution of compliance

	MALE		FEMALE		Z	p-value
	Mean	SD	Mean	SD		
First CS/KG	0.74	0.38	0.77	0.35	-0.323	0.748
Last CS/KG	0.80	0.40	0.81	0.45	-0.078	0.938

As explained in table 23, Mean compliance on 2nd day in males was 0.74±0.38 ml/kg/H_2O and in female, compliance was 0.77 ±0.35ml/kg/H_2O.

Mean compliance on last day of ventilatory support in males was 0.80±0.40 ml/kg/H_2O and in female was 0.81±0.45 ml/kg/H_2O.

There was no statistical significance in the difference between the two (p value 0.748).

Table 24: Mean compliance in various Age Groups

	AGE	N	Mean	Std. Deviation	95% Confidence Interval for Mean Lower Bound Upper Bound		Std. Error	Minimum	Maximum	F	p-value
First CS/KG	< 1 yrs	26	0.71	0.43	0.53	0.88	0.08	0.10	1.56	2.111	0.550
	1-5 yrs	35	0.80	0.36	0.67	0.92	0.06	0.25	1.71		
	6-10 yrs	30	0.80	0.39	0.66	0.95	0.07	0.08	1.83		
	> 10 yrs	23	0.68	0.26	0.57	0.79	0.05	0.11	1.11		
Last CS/KG	< 1 yrs	26	0.77	0.52	0.56	0.98	0.10	0.05	2.06	3.81	0.283
	1-5 yrs	35	0.82	0.37	0.70	0.95	0.06	0.23	1.60		
	6-10 yrs	30	0.90	0.44	0.74	1.06	0.08	0.10	1.80		
	> 10 yrs	23	0.69	0.32	0.56	0.83	0.07	0.13	1.45		
Differene	< 1 yrs	26	0.07	0.51	-0.14	0.27	0.10	-1.29	1.10	2.085	0.555
	1-5 yrs	35	0.03	0.29	-0.07	0.13	0.05	-0.56	0.68		
	6-10 yrs	30	0.10	0.28	-0.01	0.20	0.05	-0.44	1.10		
	> 10 yrs	23	0.02	0.25	-0.09	0.12	0.05	-0.87	0.50		
Percentage change	< 1 yrs	26	-43.02	193.10	-121.02	34.97	37.87	-900.00	91.67	1.487	0.685
	1-5 yrs	35	-3.54	36.84	-16.19	9.12	6.23	-106.35	70.00		
	6-10 yrs	30	0.08	50.27	-18.69	18.85	9.18	-200.00	88.00		
	> 10 yrs	23	-18.94	106.40	-64.96	27.07	22.19	-486.67	73.33		

As the above table number 24, suggests, mean compliance on day 2 of ventilatory support in age group <1years, 1-5 years, 6-10 years and >10 years were 0.71 ,0.8 ,0.8 and 0.68 ml/kg/H_2O respectively. The difference in compliance between all these age groups was found to be statistically non-significant (p value 0.550).

Mean compliance on last day of ventilatory support for age <1 years, 1-5 years, 6-10 years and > 10 years were 0.77, 0.82,0.90 and 0.69 ml/kg/H_2O respectively. The difference in the compliance of all these age groups was found to be statistically non-significant. (p value 0.283)

The difference between the compliance on the 2nd and last day was found to be statistically non-significant. (p value 0.555)

In less than 1 year of age, maximum compliance recorded was 1.56 ml/kg/H_2O and minimum compliance recorded was 0.10 ml/kg/H2O. In the age group of 1-5 years maximum and minimum compliance recorded came out to be 1.71 ml/kg/H_2O and 0.25 ml/kg/H_2O respectively. Similarly in the age group of 6-10 years maximum and minimum compliance was 1.83 ml/kg/H_2O and 0.08 ml/kg/H_2O respectively. For the age group of greater than 10 years of age, maximum and minimum compliance was 1.11 ml/kg/H_2O and 0.11 ml/kg/H_2O respectively.

Table 25: Mean compliance in respiratory and non-respiratory cases

	Non-Respiratory		Respiratory		Z	p-value
	Mean	SD	Mean	SD		
First CS/KG (ml/kg/H_2O)	0.83	0.37	0.58	0.31	-3.237	0.001
Last CS/KG (ml/kg/H_2O)	0.87	0.42	0.68	0.39	-2.335	0.020
Difference	0.03	0.36	0.09	0.28	-0.079	0.937
Percentage change	-22.11	128.15	1.37	39.55	-0.113	0.910

AS seen in table 25, Mean compliance on day 2 of ventilatory support in non-respiratory cases was 0.83 ± 0.37ml/kg/H_2O and in respiratory cases corresponding compliance was 0.58 ± 0.31 ml/kg/H_2O. Difference in compliance in respiratory cases and non-respiratory cases came out to be statistically significant (p value 0.001). Mean Compliance on last day of ventilatory support in non-respiratory cases was 0.87± 0.42ml/kg/H_2O and corresponding value in respiratory cases was 0.68 ± 0.39 ml/kg/H_2O. The difference in these values i.e. compliance being higher in non-respiratory causes due to underlying healthy lung and lower in primary respiratory pathology due to underlying pathology leading to reduced elasticity of lung was also observed this difference in compliance was also found to be statistically significant (p value 0.020)

Table 26: System wise distribution of average compliance on 2nd day of ventilation (24 hours)

	PRIMARY DIAGNOSIS	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
First CS/KG	RESPIRATORY	36	0.57	0.30	0.05	0.47	0.67	0.08	1.23
	CNS	27	0.93	0.36	0.07	0.78	1.07	0.40	1.83
	GASTROIN	13	0.86	0.37	0.10	0.65	1.07	0.39	1.71
	TRAUMA	13	0.91	0.41	0.11	0.66	1.16	0.30	1.56
	CVS	5	0.73	0.48	0.21	0.13	1.33	0.10	1.25
	NEUROMUSCULAR	5	0.85	0.29	0.13	0.50	1.21	0.56	1.20
	INFECTION	4	0.46	0.39	0.20	-0.16	1.08	0.11	1.00
	SURGICAL	3	0.54	0.25	0.15	-0.09	1.17	0.26	0.76
	ONCO	2	0.61	0.13	0.09	-0.55	1.78	0.52	0.71
	POISON	2	0.68	0.04	0.03	0.30	1.07	0.65	0.71
	RENAL	2	0.67	0.09	0.07	-0.17	1.52	0.61	0.74
	ENDOCRINE	1	1.05	.	.	.	.	1.05	1.05
	HEMATO	1	0.67	.	.	.	.	0.67	0.67
	Total	114	0.75	0.37	0.03	0.68	0.82	0.08	1.83

As per table number 26, in respiratory system average compliance of 0.57±0.30 ml/kg/H_2O was seen in this study. In patients with primary involvement of central nervous system, mean compliance observed was 0.93±0.36 ml/kg/H_2O with minimum compliance of 0.40 ml/kg/H_2O and maximum compliance recorded was 1.83 ml/kg/H_2O. In gastrointestinal system mean compliance recorded was 0.86±0.37ml/kg/H_2O. In traumatic brain injury, compliance recorded was

0.91±0.41 ml/kg/H_2O. In cardiovascular system, average compliance at the beginning of ventilation was 0.73±0.48 ml/kg/H_2O with maximum recorded compliance of 1.25 ml/kg/H_2O and minimum compliance of 0.1 ml/kg/H_2O. In neuromuscular disorder average compliance observed was 0.85±0.29 ml/kg/H_2O with maximum compliance of 1.2 ml/kg/H_2O and a minimum compliance of 0.56 ml/kg/H_2O. In primary infectious etiology average compliance of 0.46±0.39 ml/kg/H_2O. In surgical cases an average compliance of 0.54±0.25 ml/kg/H_2O was observed. In oncological disorder average compliance of 0.61±0.13 ml/kg/H_2O was observed. In acute poisoning and primary renal etiology average compliance of 0.68±0.04 ml/kg/H_2O and 0.67±0.09 ml/kg/H_2O respectively Average compliance in endocrine system was 1.05 ml/kg/H_2O. In Hematology, average compliance recorded was 0.67 ml/kg/H_2O.

Table 27 : System wise distribution of average compliance on last day of ventilation

	Primary diagnosis	number	Mean	Standard deviation	Standard Error	95% Confidence interval		Minimum	Maximum
						Upper limit	Lower limit		
	RESPIRATORY	36	0.67	0.39	0.07	0.54	0.81	0.05	1.79
	CNS	27	1.04	0.40	0.08	0.88	1.20	0.28	2.06
Last CS/KG	GASTROIN	13	0.83	0.39	0.10	0.61	1.05	0.20	1.45
	TRAUMA	13	0.82	0.54	0.15	0.50	1.15	0.10	1.80
	NEUROMUSCULAR	5	0.71	0.25	0.11	0.40	1.02	0.50	1.13
	CVS	5	1.05	0.40	0.18	0.56	1.55	0.70	1.67
	INFECTION	4	0.64	0.26	0.13	0.23	1.05	0.42	1.00
	SURGICAL	3	0.56	0.23	0.14	-0.02	1.14	0.30	0.76
	ONCO	2	0.55	0.14	0.10	-0.69	1.79	0.45	0.65
	POISON	2	0.97	0.13	0.09	-0.21	2.15	0.88	1.07
	RENAL	2	0.68	0.11	0.07	-0.26	1.63	0.61	0.76
	ENDOCRINE	1	0.18	.	.	.	.	0.18	0.18
	HEMATO	1	0.34	.	.	.	.	0.34	0.34
	Total	114	0.81	0.42	0.04	0.73	0.88	0.05	2.06

As per the table number 27, in respiratory pathology average compliance recorded on the last day of ventilation was 0.67±0.39 ml/kg/H_2O ml/kg/H_2O.Average compliance observed in central nervous system on the last day of the study was

1.04±0.4 ml/kg/H_2O with maximum observed compliance observed during the study being 2.06 ml/kg/H_2O and minimum compliance being 0.28 ml/kg/H_2O.In gastrointestinal system average compliance of 0.83. In neuromuscular system mean compliance of 0.71±0.25 ml/kg/H_2O was observed with maximum recorded compliance being 1.13 ml/kg/H_2O and minimum compliance being 0.50 ml/kg/H_2O. In cardiovascular system mean compliance of 1.05 ml/kg/H_2O was recorded. In primary infectious etiology 0.64±0.26 ml/kg/H_2O. In hematological system average compliance of 0.34 ml/kg/H_2O was recorded.

Table 28: Mean first and last compliance in patients with ARDS

	ARD	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum	F	p-value
						Lower Bound	Upper Bound				
First CS/KG	Mild	5	0.76	0.34	0.15	0.33	1.19	0.26	1.07	1.965	0.161
	Moderate	4	0.45	0.20	0.10	0.13	0.77	0.15	0.59		
	Severe	19	0.53	0.24	0.06	0.41	0.65	0.15	0.92		
	Total	28	0.56	0.27	0.05	0.46	0.66	0.15	1.07		
Last CS/KG	Mild	5	0.92	0.68	0.30	0.09	1.76	0.30	2.06	1.531	0.236
	Moderate	4	0.77	0.37	0.19	0.18	1.36	0.39	1.25		
	Severe	19	0.58	0.33	0.08	0.42	0.74	0.10	1.50		
	Total	28	0.67	0.42	0.08	0.51	0.83	0.10	2.06		

As shown in table number 28, mean compliance after 24 hours of ventilation was 0.76±0.34 ml/kg/H_2O in cases of mild ARDS. In moderate ARDs mean compliance recorded was 0.45±0.20 ml/kg/H_2O and in severe ARDS mean compliance of 0.53 ml/kg/H_2O was recorded. There was no statistical significance in the difference between compliance in mild, moderate, and severe ARDS (p value 0.167)

Mean compliance on the last day of ventilation was 0.92±0.68 ml/kg/H_2O in cases of mild ARDS in moderate ARDs mean compliance recorded was 0.77±0.37 ml/kg/H_2O and in severe ARDS mean compliance of 0.58±0.33 ml/kg/H_2O was recorded. There was no statistical significance in the difference between compliance in mild, moderate, and severe ARDS (p value 0.236)

Table 29: Compliance as a utility tool in predicting extubation success or failure

EXTUBATION FAILURE	NO		YES		Z	p-value
	Mean	SD	Mean	SD		
CSTAT/Kg AT EXTUBATION	0.83	0.36	0.48	0.17	-3.242	0.001
Median (IQR)	0.58	0.40-0.77	0.50	0.43-0.57		

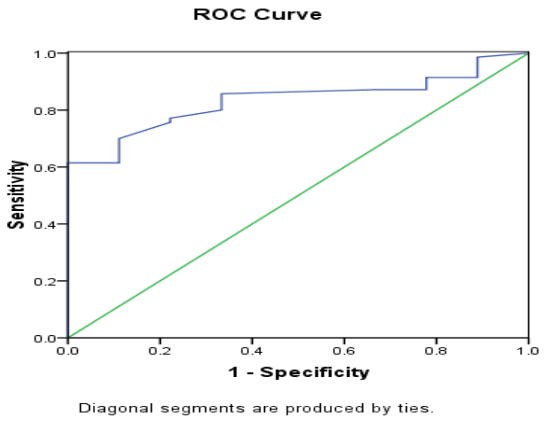
As shown in table no 29, In our study it was observed that 79 patients were extubated out of which 9(11.3%) patients had extubation at failure within 72 hours. The rest of the 70(88.7%) patients were successfully extubated.

Out of the 9 patients who had extubation failure, 5 of the patients were subsequently extubated successfully. Three of the patients died post reintubation. One of the patients took DAMA.

Mean compliance in patients at the time of extubation in those who had successful weaning was 0.83±0.36 ml/kg/cm of H_2O as per the study. Mean compliance in patients who had extubation failure was 0.43±0.17ml/kg/cm of H_2O. The difference between the two was statistically significant. (p value 0.001)

RECEIVER OPERATING CURVE: Compliance vs Extubation

Figure 7: ROC : Compliance as a dignostic utility tool for predicting extubation failure



In our study, it was observed that 79 patients were extubated out of which 11.3% patients had extubation failure within 72 hours and 88.7% of the patients were successfully extubated.

This curve presents compliance as a diagnostic utility tool in forecasting extubation successfully.

The AUC is 0.833 with a standard error of 0.05 with a P value of 0. 001. The 95% confidence interval ranges from 0.736-0.931

This indicates that compliance has a statistical significance in predicting successful extubation. As per the above ROC a patient with static Compliance equal to above 0.715 ml/kg/H_2O has a very good chance of being successful weaned of ventilation as compared to a patient with static compliance less than 0.715 ml/kg/H_2O. This value has a sensitivity of 100% and a specificity of 61%. Positive predictive value of the same is 25% and negative predictive value is 100%

Table 30: Correlation of compliance with duration of ventilation, duration of PICU stay and mortality

Overall						
C static	Coef.	Std. Err.	z	p-value	95% CI	
					Lower	Upper
DUARTION OF VENTILATION	-0.019	0.004	-4.310	0.001	-0.028	-0.011
DURATION IN PICU	0.010	0.003	3.070	0.002	0.004	0.017
Mortality	-0.100	0.028	-3.590	0.001	-0.155	-0.046
Cons	0.876	0.026	34.010	0.001	0.826	0.927

VENTILATION DAYS:

Coefficient: -0.019

This variable has a negative coefficient, indicating that increase in compliance decreases the duration of ventilation.

For each one-point increase compliance, duration of ventilation decreases by 0.019 points.

The coefficient is statistically significant with a z-score of -4.310 and a p-value of 0.001.

The 95% confidence interval for the coefficient ranges from -0.028 to -0.011.

DURATION OF PICU STAY:

Coefficient: 0.010

This variable has a positive coefficient, suggesting that an increase in the compliance associated with an increase in the duration of PICU. It could be due to increased likelihood for survival.

The coefficient is statistically significant with a z-score of 3.070 and a p-value of 0.002.

The 95% confidence interval for the coefficient ranges from 0.004 to 0.017.

Mortality:

Coefficient: -0.100

This variable has a negative coefficient, indicating that mortality is negatively related to the compliance implying increased compliance leads to positive outcome in terms of decreased mortality and increased chances of survival and subsequent discharge.

For each one-point increase in Compliance, mortality decreases by 0.1 points.

The coefficient is statistically significant with a z-score of -3.590 and a p-value of 0.001.

The 95% confidence interval for the coefficient ranges from -0.155 to -0.046.

Table 31: Correlation of compliance with duration of ventilation, duration of PICU stay and mortality in cases with primary respiratory pathology

C static	Coef.	Std. Err.	z	p-value	95% CI	
					Lower	Upper
Duration of ventilation	-0.007	0.005	-1.370	0.169	-0.017	0.003
Duration in PICU	0.000	0.004	0.000	0.997	-0.007	0.007
Mortality	-0.053	0.037	-1.420	0.157	-0.126	0.020
Cons	0.743	0.034	21.620	0.000	0.676	0.810

Out of 114 cases, 36 cases presented with primary respiratory pathology which upon analysis revealed the following results:

VENTILATION DAYS:

The coefficient for duration of ventilation is -0.007. This suggests that as compliance increases duration of ventilation decreases.

The z-score of -1.370 and the p-value of 0.169 indicate that the coefficient is not statistically significant at the conventional significance level of 0.05.

The 95% confidence interval for the coefficient ranges from -0.017 to 0.003, showing the plausible range of values for the true coefficient.

DURATION IN PICU:

The coefficient for "duration in PICU" is 0.000, indicating that the duration of stay in the PICU does not have a significant impact on the outcome variable.

The z-score of 0.000 and the high p-value of 0.997 confirm that this correlation is not statistically significant.

The 95% confidence interval for the coefficient ranges from -0.007 to 0.007, further supporting the lack of a significant effect.

Mortality:

coefficient for is -0.053, suggesting a negative relationship with compliance and mortality indicating increase in compliance leads to decreased mortality.

The z-score of -1.420 and the p-value of 0.157 indicate that the relationship between compliance and mortality is not statistically significant.

The 95% confidence interval for the coefficient ranges from -0.126 to 0.020, showing uncertainty in the estimate.

Although compliance seems to have a significant correlation in overall cases. A significant correlation could not be elicited in cases of primary respiratory pathology may be attributable to smaller sample size. Further studies and larger sample size are needed to confirm a correlation between compliance and the above-mentioned factors.

Table 32: Correlation of compliance with duration of ventilation, duration of PICU stay and mortality in cases with primary non-respiratory pathology

C static	Coef.	Std. Err.	z	p-value	95% CI	
					Lower	Upper
VENTILATION DAYS	-0.035	0.007	-4.900	0.001	-0.049	-0.021
DURATION IN PICU	0.026	0.006	4.730	0.001	0.015	0.037
Mortality	-0.064	0.040	-1.610	0.107	-0.143	0.014
Cons	0.877	0.035	25.400	0.001	0.809	0.944

Out of 114 cases, 78 cases with primary non respiratory etiologic:

VENTILATION DAYS:

The coefficient for "VENTILATION DAYS" is -0.035. This negative coefficient suggests that increase in compliance is associated with decreases in the duration of ventilation.

For each one-point increase in compliance, duration of ventilation decreases by 0.035 points indicating increase in compliance decreases the duration of ventilation.

The z-score of -4.900 and the low p-value of 0.001 indicate that this coefficient is statistically significant.

The 95% confidence interval for the coefficient ranges from -0.049 to -0.021.

DURATION IN PICU:

The coefficient for "DURATION IN PICU" is 0.026. This positive coefficient indicates that a longer duration in the PICU is associated with an increase in compliance. This could be due to better compliance leading to increased chances of survival.

The z-score of 4.730 and the low p-value of 0.001 suggest that this coefficient is statistically significant.

The 95% confidence interval for the coefficient ranges from 0.015 to 0.037.

Mortality:

The coefficient for "Mortality" is -0.064. This negative coefficient suggests that increase in compliance leads to decreases in mortality indicating positive outcome that is better chance of survival in those with greater compliance.

The z-score of -1.610 and the p-value of 0.107 indicate that this coefficient is not statistically significant. Larger sample size needed to prove the association.

The 95% confidence interval for the coefficient ranges from -0.143 to 0.014.

TABLE 33: DIFFERENCE IN VARIOUS PARAMETERS BETWEEN SURVIVORS AND NON-SURVIVORS

	SURVIVORS				NON SURVIVOURS				Z	p-value
	Mean	SD	Median	IQR	Mean	SD	Median	IQR		
AGE IN YEARS	6.20	4.72	5.00	2-9.83	6.16	5.33	5.50	0.9375-11.75	-0.228	0.819
SOFA	3.56	2.77	3.00	2-5	4.85	3.34	4.00	2.25-7	-1.684	0.092
PRISM	23.23	7.52	24.00	18-28	29.00	7.28	28.50	23.5-35	-2.854	0.004
First CS/KG	0.73	0.34	0.74	0.53-0.9	0.56	0.37	0.49	0.18-0.9	-1.853	0.064
Last CS/KG	0.86	0.35	0.83	0.583-1.11	0.63	0.56	0.53	0.19-0.88	-2.880	0.004
Difference	0.09	0.27	0.04	(-0.03)-0.167	0.07	0.36	0.01	(-0.07)-0.23	-0.434	0.664
Percentage change	3.72	37.19	5.56	(-6.06)-20	-26.99	119.26	1.61	(-43.98)-31.18	-0.421	0.674
Oxygen saturation index	3.87	2.80	2.86	2.1875-4.79	6.34	5.16	4.29	2.25-9.14	-1.789	0.074
PEEP A	5.95	1.56	5.00	5-6.5	9.48	13.25	5.75	5-8	-1.340	0.180
VT/BW	8.02	3.89	7.70	6.43-9.18	8.11	5.74	7.11	5.51-8.4	-1.196	0.232
PIP1	19.70	4.39	19.00	17-23	22.28	4.40	22.25	18.25-26.5	-2.312	0.021

Oxygen saturation index is calculated as: -

Mean airway pressure x FiO_2 / SpO_2

AS shown in table number 33, in our study out of a total of 114, Seventy-six (66.6%) patients were discharged. Twenty (17.6%) of patients died. The rest of the 18(15.8%) of the patients took Discharge against medical advice. During the analysis patients who took DAMA were excluded as their outcome could not be traced.

As per the above table number, average age in survivors was 6.2 ±4.72 years and average age in non survivors was 6.16±5.33 years. The average age was comparable and on comparison difference between the two was found to be statistically non-significant (p value 0.819).

The mean SOFA score in survivors was 3.56±2.77 and in non-survivors' average SOFA Score was 4.85±3.34. Although average SOFA was found to be Higher in non survivors, it was found to be statistically non-significant (0.092).

The mean PRISM score in survivors was 23.23±7.52 and in non survivors it was 29±7.28. The PRISM score was found to be higher in non-survivors and it was found to be statistically significant (p value 0.004).

The mean Static compliance taken after 24 hours of intubation in survivors was 0.73±0.34 ml/kg/H_2O and in non survivors was 0.56±0.37 ml/kg/H_2O. Although average static compliance was found to be higher in survivors, this finding was found to be statistically non-significant (p value 0.064).

The mean static compliance on the last day of ventilation in survivors and non survivors was 0.86±0.35 ml/kg/H_2O and 0.63±0.56 ml/kg/H_2O respectively. Static compliance was found to be lower in non survivors and this observation was also found to statistically significant (p value 0.004)

The mean difference between the first and last compliance in survivors and non survivors was recorded to be 0.09±0.27 ml/kg/H_2O and 0.07±0.36 ml/kg/H_2O respectively. This was found to be statistically non-significant (p value 0.664)

In Survivors the mean Oxygen saturation index was 3.86±2.8 and in non survivors it was 6.34±5.16. The oxygen saturation index when compared between the two was found to be statistically non-significant (p value 0.074) although it was higher in non survivors.

Mean PEEP in survivors was 5.95 ±1.56 and in non survivors it was 9.48±13.25. Median PEEP in survivors and non survivors was 5(IR 5-6.5) and 5.75 (IR 5-8) respectively. Although higher PEEP was needed in Non survivors, this was found to be statistically non-significant (p value 0.180).

Mean tidal Volume adjusted to body weight in survivors was 8.02±3.89 ml/kg and in non survivors it was 8.11±5.74 ml/kg. which was comparable between the two and was found to be statistically non-significant (p value 0.232).

Mean Peak inspiratory pressure (PIP) in survivors was 19.7 ±4.39 and in non survivors it was 22.28 ±4.4. Median PIP in survivors and non survivors was 19(IR 17-23) and 22.25 (IR 18.25-26.5) respectively. Higher PIP was needed in Non survivors and on comparison this difference was found to be statically significant (p value 0.021)

Table 34 : Potential Predictors of Mortality

variables	p-value	OR	95% C.I.for EXP(B)	
			Lower	Upper
SOFA	0.083	1.191	0.977	1.452
PRISM	0.004	1.135	1.040	1.238
PEEPA	0.096	1.097	0.984	1.222
PIP1	0.104	1.130	0.975	1.309
Constant	0.000	0.000		

As seen in table number 34, various Factors like age of the patient, SOFA and PRISM score, first and last value of Static compliance, PIP and PEEP taken after 24 hours of ventilation, tidal volume adjusted to body weight and OSI were evaluated as potential predictors of mortality by multivariate regression analysis.

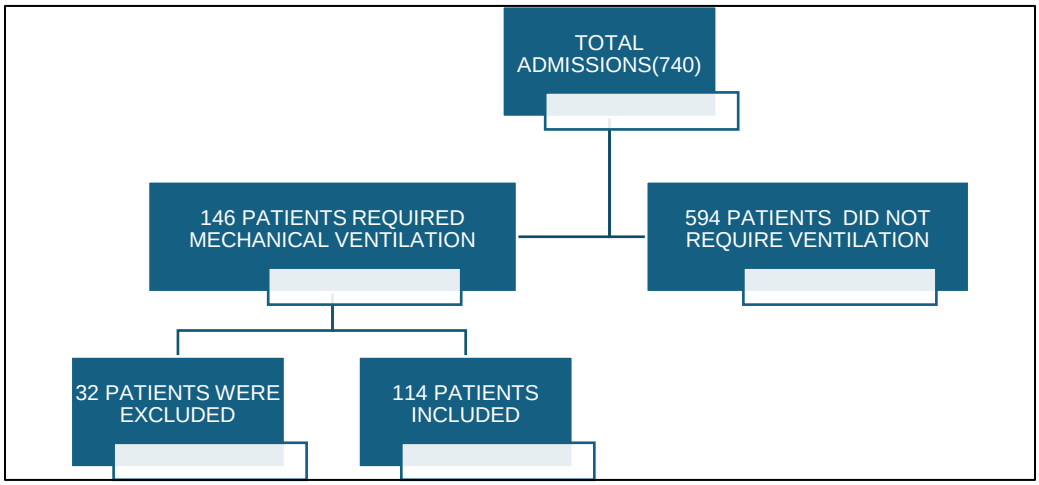
The analysis revealed a linear relationship between mortality and SOFA score although P value came out to be non-significant. (p value 0.083, OR 1.191, CI 0.977-1.452). A linear relationship was found between PEEP and mortality, but statistical significance could not be elicited (p value 0.096, OR 1.097, CI 0.984-1.222). A linear relationship between PIP and mortality could also be established but p value came out to be non-significant. (p value 0.104, OR 1.130, CI 0.975-1.3)

Analysis revealed a linear relationship between mortality and PRISM score. Statistical significance could also be elicited. (p value 0.004, OR 1.135, CI 1.040-1.238).

DISCUSSION

Our study was a prospective observational study of 1 year 3 months duration (July 1, 2022 to September 30, 2023) conducted on children admitted to the Pediatric Intensive Care Unit (PICU) of a tertiary care multi-specialty teaching hospital (DMCH, Ludhiana). Critically sick patients admitted to the PICU with clinical diagnosis of Respiratory failure and requiring Mechanical ventilation support for greater than 24 hours were included in the study. All patients either less than 1 month of age, those requiring mechanical ventilation for less than 24 hours or in those where inspiratory pause maneuvers were not possible due to spontaneous breaths were excluded for the study. Since children end up in respiratory failure due to variable causes, studying respiratory mechanics can provide us with a good prognostic marker to determine the outcome. In children, primarily Pressure control mode is used in which compliance can be checked (C static gets displayed on ventilator after pressing the inspiratory pause on the ventilator panel) This study was prospectively conducted to know the Compliance of lungs in children requiring Mechanical ventilator and to correlate it with the outcome including duration of ventilation, PICU stay and mortality.

During the duration of study i.e. from July 1, 2022 to September 30, 2023, total of 740 patients were admitted to PICU out of which 146 patients needed mechanical ventilation due to various causes. Thirty-two patients were excluded from the study as 12 of them were neonates, 11 required ventilatory support for less than 24 hours and in rest of the 9 patients, the inspiratory pause was not possible due to spontaneous breathing.


TOTAL ADMISSIONS(740)
146 PATIENTS REQUIRED MECHANICAL VENTILATION
594 PATIENTS DID NOT REQUIRE VENTILATION
32 PATIENTS WERE EXCLUDED
114 PATIENTS INCLUDED

A mechanical ventilator, put in simple words is a life-support machine that assists or replaces the function of the lungs, delivering air into the airways and lungs to facilitate gas exchange when a person is unable to breathe adequately on their own. Study done by Eriskson et all came to the conclusion that approximately 30 % of children shifted to PICU need intubation and mechanical ventilation, mainly because of either primary respiratory or cardiovascular pathology [54,55] Mechanical ventilation is frequently needed in pediatric patients to ensure adequate exchange of gases, ameliorate respiratory distress, and enable resolution of pulmonary or other disorders [57]. While respiratory pathologies leading to distress and respiratory failure remains one the major indication for invasive mechanical ventilation, several other non-respiratory causes for mechanical ventilation, including congenital heart disease, shock, neurological and neuromuscular pathology and postoperative care and pain management. [98] However, pediatric population is uniquely challenging because of the paucity of large-scale randomized controlled trials needed for generating data and forming a clinical consensus and guidelines for treatment. [57] Pediatric Mechanical Ventilation Consensus Conference (PEMVECC) which was formulated by a panel of 15 experts also acknowledged that most of the clinical practices in pediatric mechanical ventilation were based on individual experiences and what pediatric intensivists have adopted from adult and neonatal experiences

and protocol. [58] Another study by Khemani et all also addressed the need for further research in pediatric ventilation and stated that Pediatric practitioners face a unique and an exceptional challenge in attempting to adapt or translate adult-derived ventilation guidelines for acute respiratory distress syndrome or acute lung injury into pediatric practice. [92]

Another research stated that pediatric acute respiratory distress syndrome is still the leading cause of morbidity and mortality, with predicted mortality rates being as high as 50% in patients with severe PARDS. Despite these figures, pediatric mechanical ventilation and lung injury in pediatrics has been poorly explored, with almost all the studies being either observational or retrospective and only a handful of them being randomized controlled trials to direct the pediatric intensivists. The most advanced globally accepted guidelines like PEMVECC by European society for pediatric for pediatric lung injury are based on an agreement rather than clinical trials. Thus, most of the pediatric and neonatal mechanical ventilation guidelines and practices have been arbitrarily extrapolated to pediatric population from adult guidelines and clinical trial neglecting the basic difference in anatomy, pathophysiology and etiology between adults and pediatric population. [95]

Respiratory mechanics including compliance and resistance have been studied extensively in adults, but no such studies have been conducted in children. Since children end up in respiratory failure due to a wide spectrum of diseases, studying respiratory mechanics can provide us a good prognostic marker to determine the outcome. Physiologic measures, including respiratory mechanics, could augment the medical management of the critically ill neonatal and pediatric patient on ventilator and reduce the chances of ventilator associated lung injury. There is paucity of information on the applicability and usefulness of the above-mentioned tests in the pediatric and neonatal intensive care (PICU, NICU). [83] Measurement of these respiratory mechanics in mechanically ventilated children, could give useful information about the pathophysiological status

of the respiratory system and disease pathology and potentially can also predict response to treatment interventions administered. [91]

AGE

Subjects with age ranging from 1 month to 18 years were included in our study. Neonates were excluded from the study. In our study, out of total 114 subjects, 35 (30.7%) were between 1 to 5 years of age, 23 (20.2%) of subjects aged more than 10 years. Thirty patients (26.3%) were between 6-10 years of age and 26 subjects (22.8%) were less than 1 year of age. Thus, maximum subjects were in the age group of 1-5 years of age. The youngest subject was 1 month, and the eldest one was 16 years of age. The mean age of the study group was 5.86 $\pm$ 4.77 years and the median age was 5 years (IR 1.56-9.52). Thus, the sample was representative of all age groups of children. The age distribution of subjects was similar to what was reported in many other studies done in pediatric [104-108] ICUs in India and developed countries. As per the study done in Apollo Delhi, the mean age for admission in PICU was 3.5±1.5 years. [106] Another study done by P.K Patra on nosocomial infection in PICU showed 3.7 years as the median age of distribution in PICU. [109] Another study demonstrated that maximum admission in PICU was in the age group of 1.5 years of age. [110] In another study conducted by Dave hemal, percentage distribution was reported as 37.04% infants, 51.39% between 1-11 years and 11.58% more than 11 years age. [111]

GENDER

In our study group, out of total subjects, 40 (35.1%) were female and remaining 74 (64.9%) were male making a total of 114. Male is to female ratio was 1.8:1. This can be possible because of the inherent gender bias seen in developing countries, with the male child being favored over the female child.

Khilnani et al reported a similar gender distribution (2.8:1) in their study on demographic profile of children admitted to PICU. [106,] Male to female ratio of 1.8:1 was also reported by P.K patra in his study on nosocomial

infection in Pediatric intensive care unit. [109]. Dave hemal in his study also reported a gender distribution similar to our study with male to female ratio of 1.8:1. [111]

PRIMARY SYSTEM INVOLVED AND DIAGNOSIS:

Subjects enrolled into the study had diverse diagnosis and systems involved. Most common system involved was respiratory system followed by central nervous system. The most common diagnosis of the subjects was acute respiratory distress syndrome. Khilnani et al also found that neurological and respiratory were the most common systems involved in children admitted to pediatric ICU.[106] Another study done by Mokhlesi et al., Oliveira and Filho, and Edmunds et al. also came out with similar conclusions. [112] In another studies, as well, the most common indication for mechanical ventilation in children was found respiratory conditions. [113] Another study done to look for factors predicting extubation failure in children also reported respiratory pathology as the most common cause of intubation in children. [114]

COMPLICATION DURING PICU STAY

In our study, 5.2% of the patients developed ventilator associated pneumonia in consistence with study by Natália Antalová, which states that VAP is diagnosed in greater than 10% of patients on mechanical ventilator with incidence rising with increase in duration of ventilation. [115] Srinivasan et al. from Boston also reported the incidence of VAP as 32%. [116] Study done on nosocomial infection by P.K. Patra also found out 32% of the total patients admitted to PICU developed nosocomial infection. (109) Hemal Dave also reported the incidence of VAP as 1.8% in his study. [111]

DURATION OF VENTILATION

In our study ,114 patients required ventilatory support, out of which twelve (10.5%) patients needed a ventilator for less than 3 days, forty (35.1%) of the patients stayed on ventilator for 3-7days and sixty seven (54.4%) out of 114 patients needed a ventilator for more than 7 days. Mean ventilatory

duration was 9.11±6.48 days and median stay was 7 days (IR 5-7). In a study by Hemal dave et al, 31% of the cases required ventilatory support with mean and median duration of ventilation were 4.3 and 3 days respectively. [111] Mean duration of ventilation was reported to be 6.39±1.2 days by Khilnani et al[106]. In another study on risk factors for extubation failure majority of the patients had a ventilatory stay on greater than 72 hours with average duration of stay being 6.9±4.4 days. [114] In another study done on adults to compare Static compliance with mortality average ventilatory stay came out to be 12 days. [117] In another study comparing various factors associated with mortality in Covid 19 patients, ventilatory stay was found to be for 14.92 days. [118]

DURATIONOF PICU STAY

In our study most patients stayed in the PICU for 7-14 days. Mean stay in PICU was 12.12±8.74 days and median stay was 9(IR 6-15) days. In a study conducted by Dave et all, mean PICU stay was 7.4 days and median stay was 4 days. [111] The median length of PICU stay was 4 days in J.A. Farias [119] study. Khilnani et al also reported the average duration of PICU stay as 4.52 days±2.6 days. [106]

OUTCOME

In our study, 76 (66.6%) patients were discharged. Eighteen (15.8%) out of 114 patients took discharge against medical advice and 20(17.6%) of the patients died. Most common reasons for taking discharge against medical advice were financial constraints followed by poor outcome and prognosis. In a retrospective study by Dave et al, mortality rate was 12.5% [111] which is significantly lower than J.A. Farias [119] and T. Vijayakumar [120] studies. The Khilnani study also reported a mortality rate of 6.72%. [106] Overall mortality was reported to be 15% in Ashish Kumar study. [121] In Dave study [111], rate of DAMA was reported to be 37.5% and most common reason for taking DAMA was due to poor neurological outcome and high financial burden on family.

PRISM SCORE

Pediatric risk of mortality (PRISM) is one of scores used in pediatric intensive care unit to predict that chances of mortality in a sick patient. The score was calculated in all the patients at the time of admission. This score includes 14 variables like GCS, Pupillary Reactions, respiratory rate, PaCO2, paO2/FiO2, Systolic blood pressure, diastolic blood pressure, heart rate, coagulation profile, glucose, Potassium, Total bilirubin, calcium, bicarbonate. The higher the score, the higher the risk for mortality.

In our study, nineteen (16.7%) of the patients had a PRISM score of less than ten. Ninety-five (95%) of the patients had a PRISM score of more than ten. Mean PRISM score is 22.90 ±9.85. Median PRISM came out to be 25 (IR15-30). Minimum PRISM was 4. Maximum PRISM was 40.

As per a study conducted by MM Anjali et all, the higher PRISM score higher is the mortality. PRISM score of 12 predicted mortality, with a 100% sensitivity and a specificity of 91%. PRISM score of 7 predicted mortality with 100% sensitivity and 95% specificity. The study further postulated that predicted mortality was in consistence with the actual mortality rate thus giving an accurate approximation of the prognosis and outcome of the patients admitted to PICU thereby establishing that higher PRISM score is associated with higher mortality. [122] There are similar studies all over the world done by Pollack study [123], Balakrishnan study [124] and, by El Nawawy [125] from Alexandria proving that PRISM is a useful predictor of mortality. Another study postulated that a PRISM score of 10.5 or greater at 12 hours and score of 8.5 or greater at 24 hours had good sensitivity and specificity. [121] Joshi study on PRISM score conducted in B.Y.L. Nair Hospital, Mumbai, which was also presented at prestigious All India Pediatric Conference-2006 (Pedicon'2006), postulated that PRISM III score was indeed a remarkably useful tool in predicting mortality. [126]

SOFA SCORE

Sequential Organ Failure assessment (SOFA) is a commonly used scoring system in pediatrics. SOFA assesses the performance of several organ systems and hemodynamic and assign a score based on the information obtained in each category. The higher the score higher is the risk of mortality. Scores ranges from 0(best) to 24(worst). Ninety-seven (89.9%) of the patients had a SOFA score of less than ten. Seventeen (15.7%) of the patients had a SOFA score of more than ten. Mean SOFA score was 4.89±3.56. Median SOFA scores was 4(IR 2-7). Minimum SOFA score was o and maximum SOFA score was 13

As per a study done by Fuchs PA, higher SOFA scores corresponded with a compromised outcome, in all ICU population. [127] As per another article by Minnie L, although SOFA is a good marker for determining the outcome of the patient in ICU but when combined with APACHE-II and SIPS, its prognostic power increases. [128]

AVERAGE STATIC COMPLIANCE IN CHILDREN

Compliance put in simple words is the measure of distensibility of the lungs. Static compliance (CSTAT) is the ratio of the change in volume (Inspiratory tidal) to the equivalent change in transmural pressure (ΔP). It represents pulmonary compliance when the muscles are relaxed with no airflow at a given fixed volume. [14]

For 15 months, all pediatric patients (1 month-18 years) admitted to the PICU with clinical diagnosis of Respiratory failure and requiring Mechanical ventilation support for >24 hours were included in this study. Those requiring ventilator for less than 24 hours and in scenarios where the inspiratory pause was not possible due to spontaneous breathing were excluded from this study. The values of compliance were taken by pressing the inspiratory pause which is situated on ventilatory panel. The measurements were not performed on the first day of Mechanical ventilation because of the adjustments that usually needed to be made in the first 24 hours of Mechanical ventilatory support. Compliance was recorded every day after 24 hours till the last day of ventilation.

Mean compliance on day 2 was 0.75± 0.37 ml/kg/H_2O with maximum compliance observed being 1.83 ml/kg/H2O and minimum compliance of 0.08 ml/kg/H_2O recorded during the duration of study. Mean compliance on the last day of ventilation was 0.81±0.42 ml/kg/H_2O with maximum value of compliance observed being 2.06 ml/kg/H_2O and minimum value being 0.05 ml/kg/H_2O on the last day of ventilation.

There is a paucity of studies in literature defining normal value of Static compliance especially in pediatric populations. [129] Hammer defined normal value of Respiratory compliance as 1±0.04 ml/kg/ H_2O [103] in pediatric population. In a study by Derish et al, normal value of compliance was reported as 0.99±0.27 ml/kg/ H_2O. [130] In a study by Cid JLH, normal static compliance in children between 0 to 1 year of age was given as 5-15 ml/cm H_2O. [129]

In a study by Andreolio, static compliance in children with acute bronchiolitis had come out to be 0.81±0.27 ml/kg/cm/H_2O. [131] In a study conducted by Hammer et al, mean compliance in patients with acute bronchiolitis had come out to be 0.57± 0.04 ml/kg/cm/H_2O. [103] Similarly study by Derish et all reported average compliance in patients with bronchiolitis as 0.56±0.15 ml/kg/cm/H_2O [130]

In the study “The flow-time waveform predicts respiratory system resistance and compliance” Normal static compliance in healthy adults was reported as 80–100 mL/cm H_2O, whereas in acute respiratory distress syndrome, it was noted that static compliance significantly reduced to 29–42 mL/cm H_2O. [132]

GENDERWISE DISTRIBUTION OF COMPLIANCE

Mean compliance on 2nd day in males was 0.74±0.38 ml/kg/H_2O and in female, compliance was 0.77 ±0.35ml/kg/H_2O.The difference between static compliance in male and female was not found to be statistically significant as described in similar study by Robert S. Tepper in American journal of respiratory and critical care. [133]

MEAN COMPLIANCE IN RESPIRATORY AND NON-RESPIRATORY CASES

In our study mean compliance on day 2 of ventilatory support in non-respiratory cases was 0.83 ± 0.37ml/kg/H_2O and in respiratory cases corresponding compliance was 0.58 ± 0.31 ml/kg/H_2O. Difference in compliance in respiratory cases and non-respiratory cases came out to be statistically significant (0.001). Mean Compliance on the last day of ventilatory support in non-respiratory cases was 0.87± 0.42ml/kg/H_2O and corresponding value in respiratory cases was 0.68 ± 0.39 ml/kg/H_2O. The difference in these values was also found to be statistically significant (p value-0.020).

In a study by Andreolio, static compliance in acute bronchiolitis patients had come out to be 0.81±0.27 ml/kg/cm/H_2O. [131] In Hammer study, mean compliance in acute bronchiolitis had come out to be 0.57± 0.04 ml/kg/cm/H_2O. [103] Similarly in Derish study, average compliance in patients with bronchiolitis as 0.56±0.15 ml/kg/cm/H_2O which was significantly lower than the normal values of compliance reported in the studies [130] In Adults with ARDS, static compliance was found to be reduced to 29–42 mL/cm H_2O [100]

Literature states that compliance decreases in conditions like ARDs, atelectasis, abdominal distension, Pleural effusion, Pneumothorax consolidation, Obesity, and Retained secretions and increases in Emphysema (adult), Flail chest, Sternotomy. [19] A reduction in static compliance is also noted in other critically ill patients with neuromuscular diseases, pulmonary edema, pneumonia, pulmonary fibrosis, obesity, and abdominal distension [134] In a study by Annalisa Boscolo, stated that static compliance decreased up to a variable extent in patients with ARDS and this change in compliance was associated with increased mortality. [117] Similarly another study conducted in adults by Lauren A. et all stated, on comparing the cause of respiratory failure with respect to compliance subsets, those patients with primary diagnosis of ARDS, chronic

obstructive pulmonary disease or asthma had a higher probability of a respiratory compliance less than 50 mL/cm H2O [135]

SCOPE OF COMPLIANCE IN PREDICTING EXTUABTION

In our study it was observed that 79 patients were extubated out of which 9(11.3%) patients had extubation at failure within 72 hours. The rest of the 70 (88.7%) patients were successfully extubated.

Out of the 9 patients who had extubation failure, 5 of the patients were subsequently extubated successfully. Three of the patients died post reintubation. One of the patients took DAMA.

In our study we found that Compliance has a very good diagnostic power of predicting extubation failure. As per our study, a patient with static Compliance equal to above 0.715 ml/kg/H_2O has a very good chance of being successful weaned of ventilator as compared to a person with static compliance less than 0.715 ml/kg/H_2O. Mean compliance in patient who were successfully extubated was 0.83±0.36 ml/kg/H_2O and mean in those who had extubtaion failure was 0.48±0.17 ml/kg/H_2O.

Extubation failure rate was reported to be 11% as per another study published in American journal of respiratory and critical care. This study also predicted that patients who were successfully extubated had significantly better lung compliance (Cdyn: 0.59 ± 0.91) than those which had extubation failure in which cases compliance was noted to be significantly lower (0.39 ± 0.14 ml/kg/cm H_2O). [136]

A similar study conducted in adults by Boscolo A et all, stated that Respiratory compliance taken on the day of extubation can be one the capable physiological markers to potentially stratify patients with acute respiratory failure for extubation preparedness. It further came to the conclusion that extubation failure within 72 h was more frequent in patients with lower Respiratory compliance group. A Respiratory compliance of less than 50 mL/cmH_2O was not only associated with higher chances of extubation failure but also with increased risk of mortality [117]

Okabe et al. also concluded that there is a high risk of extubation failure seen in patients with compliance under 50–60 mL/cm H_2O [137]

Although there are not enough pediatric studies to compare the values in our study.

CORRELATION OF COMPLIANCE WITH MORTALITY

In our study we found out that compliance has a statistically significant role in predicting mortality (C -0.1, P value 0.001, 95%CI -0.155 to -0.046). As per our study, patient with static Compliance equal to or above 0.533 ml/kg/H_2O has more likely chance of survival as compared to a person with static compliance less than 0.533ml/kg/H_2O.

When compliance was investigated as a predictor of mortality, in primary respiratory cases, statistical significance could not be elicited (C -1.42, P value 0.157, 95%CI -0.126 to 0.020). This could be attributed to the reduced sample size.

Very little literature is available about Respiratory mechanics in pediatric population. [131]

In a study conducted by Annalisa Boscolote published in critical care journal , two hundred and forty one Covid 19 patients were enrolled .Static compliance(Cstat) , Driving Pressure (DP)and Tidal volume(VT) adjusted to weight were evaluated as potential predictor of mortality and study came to conclusion that that Compliance was non linearly associated with ICU mortality(p value 0.001), with patient at a greater risk of mortality if compliance was less than 48 ml/cmH_2O, DP and ICU mortality was linearly associated (OR 1.45, 95% CI 1.06–1.99) and increasing DP from 10 to 14 cmH_2O lead to a significant higher odds of in-ICU death , Tidal volume adjusted to ideal body weight was not associated with an increase of risk of death thus establishing Compliance as a strong predictor of mortality. [117]

A secondary analysis of the LUNG SAFE study, also suggested that lower Compliance recorded on the first day of ventilation in ARDS, were individualistically a good predictor of mortality, even though the

Compliance–mortality relationship lacked a clearcut transition point and no single cutoff of compliance could be found. [138]

Some studies have attempted to establish Static compliance as a predictor of mortality in non-Covid 19 ARDS cases but despite being associated with the severity of syndrome and the functional lung size, Compliance failed to predict mortality in these patients. [139,140]

Wide ranges of Compliance have been reported in COVID-19 ARDS patients [141,142], but the relationship between compliance as a predictor of mortality remains unclear. [143,144] Grasselli study also found that, among COVID-19 ARDS patients, those who had a 'low' Compliance at the time of presentation within 24 h of ICU admission, had a significantly higher 28-day mortality. [143] However, others have not been able to corroborate this evidence. [144]

Another study by Mancebo J, stated that static pulmonary compliance can be a used as a good diagnostic factor in patients with severe acute respiratory failure. [145] Panwar R in his article on "Compliance phenotypes in early acute respiratory distress syndrome" before the COVID-19 pandemic also stated that compliance can be a used a good predictor of mortality but a single cutoff of the same could not be established [138] However in another article by João Paulo Arruda de Oliveira, respiratory system compliance less than 30mL/cmH_2O, just after the initiation of invasive mechanical ventilation had a poor outcome, and was found to be an independent risk factor for mortality. [146] Similarly, another study conducted by Nadir Yehya and Neal J. Thomas, compliance was not found to be good predictor of mortality. [75] Study conducted by Boscolo A et al also concluded that a compliance of less than 50 mL/cm H2O was both associated with extubation failure and increased risk of mortality. [117] In a study by Bellani G, Lower Cstat and higher driving pressure were found to be independently associated with increased risk of death. [147] Another study conducted in Singapore recorded compliance on day 1 and followed the patient longitudinally over time found that COVID-

19 ARDS patients with higher value of compliance on the day of initiation of invasive ventilation and on observation it decreased longitudinal over time had a significantly higher risk of mortality. [148]

We could not find any studies in children to compare values in our study.

CORRELATION OF COMPLIANCE WITH DURATION OF VENTILATION

In our study, the correlation between compliance and duration of ventilation was found to be statistically significant (C -0.019, P value 0.001, 95% CI 0.028 to -0.011). As compliance increases duration of ventilation decreases.

When this relationship is independently studied in primary respiratory pathology, no statistical significance could be elicited (0.169). This could again be attributed to the reduced sample size.

In a multicenter observational study by Benoit Vanden under, moderate to severe ARDS complicating COVID-19, Compliance on day 1 was not associated with either the chance of breathing without any assistance at day-28 or with increased probability of a day-28 survival. [144]

These findings are in line with classical ARDS as emphasized in the Berlin consensus paper where compliance was not found to be good at predicting mortality in severe ARDS or duration of ventilation [101]

In a study conducted by Nadir Yehya and Neal J. Thomas, Increases in PIP, PEEP, and DP were associated with a significantly longer duration of ventilation, and increased C_{dyn} and PaO_2/FIO_2 were associated with relatively shorter duration of ventilation. [75]

CORRELATION OF COMPLIANCE WITH DURATION OF PICU stay.

In our study, the correlation between compliance and duration of PICU stay was found to be statistically significant (C -0.010, P value 0.002, 95% CI 0.004 to 0.017). As compliance increases duration of PICU stay increases.

When this relationship is independently studied in primary respiratory pathology, no statistical significance could be elicited (0.997). This could again be attributed to the reduced sample size.

Currently there is paucity of studies comparing the two.

PREDICTORS OF MORTALITY IN INTUBATED PATIENTS

In our study , we evaluated various potential predictors of mortality such age of the patient, SOFA and PRISM score, first and last value of Static compliance, Peak inspiratory Pressure(PIP) and Peak end expiratory Pressure (PEEP) taken after 24 hours of ventilation, tidal volume adjusted to body weight and Oxygen saturation index(OSI) and came to the conclusion that a linear relationship between mortality and SOFA score (p value 0.083, OR 1.191, CI 0.977-1.452) a linear relationship between mortality and PRISM score. (p value 0.004, OR 1.135, CI 1.040-1.238), a direct correlation was found between PEEP and mortality (p value 0.096, OR 1.097, CI 0.984-1.222). A direct correlation between PIP and mortality could also be established (p value 0.104, OR 1.130, CI 0.975-1.3).

Following the pioneer work by Amato *et al in the field of ventilation*, targeting Driving pressure (DP) < 15 cmH_2O has been identified as a standard of care in ARDS. Secondly, it proved that improving outcome by limiting DP can be achieved by using higher PEEP [139] The LUNG-SAFE study also reported an increased rate of mortality in patients of moderate or severe PARDS with Driving pressure 14 cmH_2O or above, and also proved that patients who developed ARDS during ICU admission had higher baseline DP values. [76] Study conducted by Patrick van Schelven in pediatric population further postulated that higher driving pressure was associated with increased time taken for extubation in mechanically ventilated children. [149] Driving Pressure and was evaluated as potential predictor of mortality and study came to conclusion that DP and ICU mortality was linearly associated (OR 1.45, 95% CI 1.06–1.99) and increasing DP from 10 to 14 cmH_2O lead to a significant higher odd of in-ICU death. [117] Another study published in in pediatric critical care journal quoted that changes in Driving pressure and changes in MAP had higher 30-day mortality predicting value when compared to DP on the day of ARDS diagnosis. [150] In Chang study, it was reported that patients with

ARDS had the lowest survival in the group with serial increase in the requirement of DP. [151] A meta-analysis comparing Higher and lower PEEP with ICU mortality also stated that Higher PEEP was not associated with ICU mortality. [152] Rather lower hospital mortality has been reported with higher PEEP. [153] A second systematic review and meta-analysis done to compare various values of PEEP in ICU patients without ARDS came to a conclusion that higher PEEP is not related to lower mortality rate or shorter duration of ventilation, but with higher PaO_2/FiO_2 and lesser incidence of occurrence of ARDS and hypoxemia. [154]

SUMMARY AND CONCLUSION

- This was a prospective observational study of 1 year 3 months duration (July 1,2023 to September 30, 2023) conducted on children admitted to the pediatric Intensive Care Unit (PICU) of a tertiary care multi-speciality teaching hospital (DMCH, Ludhiana). Critically sick patients admitted to the PICU with clinical diagnosis of Respiratory failure and requiring Mechanical ventilation support for more than 24 hours were included to study compliance of lungs in children on mechanical ventilator and correlate compliance with mortality, duration of PICU stay and Duration of ventilation.
- During the duration of study, a total of 740 patients were admitted to PICU out of which 114 patients were included in the study.
- Mean age of presentation was 5.86±4.77 years and median age was 5 years (IR 1.56-9.52 years).
- Male to female ratio was 1.85:1.
- Most common reason for PICU admission was respiratory pathology with ARDS as the most common diagnosis.
- Ventilator associated pneumonia (5.2%) was the most common complication.
- Thirty-one (27.2%) out of 114 of the patients needed inotropic support.
- Ninety-five (83.3%) of the patients had a PRISM score of more than 10. Mean PRISM score is 22.90 ±9.85.
- Ninety-seven (89.8%) of patients had a SOFA score of more than 10. Mean SOFA score 4.89±3.56.
- Most of the patients needed a ventilator for more than 7 days with a mean duration of ventilation was 9.11 ± 6.48 days.
- Most of the patients stayed in PICU between 7 to 14 days. Mean PICU stay was of 12.12 ± 8.74 days.
- In the end ,66.6% of the patients were discharged, 17.6% of patients died and rest of the 15.8% of the patients took discharge against medical advice.

- Out of 28 cases of ARDS, most of them were classified as severe ARDS. In total 64.2% of the patients of ARDS were discharged.
- Mean compliance on day 2 and last day of ventilation were 0.75±0.37 ml/kg/H_2O and 0.81±0.42 ml/kg/H_2O respectively with the difference between the two being statistically significant (p value 0.007).
- Difference in the values of compliance in the various age groups did not come out to be statistically significant.
- Difference in mean compliance in male and female came out to be statistically non-significant.
- The difference in the average compliance observed in the respiratory and non-respiratory group came out to be statistically significant. (0.020)
- There was no statistically significance in the difference between compliance in mild, moderate and severe ARDS
- Mean compliance in patient at the time of extubation in those who had successful weaning was 0.83±0.36 ml/kg/cm of H_2O. Mean compliance in patients who had extubation failure was 0.43±0.17ml/kg/cm of H_2O. The difference between the two was statistically significant. (p value 0.001)
- ROC curve predicted the Compliance has 100% sensitivity and 61% specificity in determining extubation failure. Static Compliance less than 0.715 ml/kg/H_2O had significant chances of extubation failure.
- There was a statistically significant relationship between compliance with duration of ventilation, duration of PICU stay and mortality. Compliance was nonlinearly associated with mortality (CI -0.1, p value 0.001) and duration of ventilation (CI -0.019, p value 0.001). Compliance was linearly associated with PICU stay (CI-0.010, p value 0.002)
- In 36 patients with primary respiratory pathology, on comparison, although there was non-linearly associated with mortality (CI -0.053, p value 0.157) and duration of ventilation (CI -0.007, p value 0.169) but

the p value had come out to be statistically non-significant. This could be attributed to the reduced sample size.

- In 78 cases of primary non respiratory pathology Compliance was found to be non-linearly associated with Mortality (CI -0.064, p value 0.107) and duration of ventilation (CI-0.035, p value). There was a linear relation between compliance and duration of PICU stay (0.026, p value 0.001)
- On comparison, difference in the PRISM, last value of static compliance and PIP was found to be statistically significant between those who were discharged and those who died.
- On multivariate analysis SOFA (p value 0.083, OR 1.191, CI 0.977-1.452), PRISM (p value 0.004, OR 1.135, CI 1.040-1.238), PEEP (p value 0.096, OR 1.097, CI 0.984-1.222), PIP (p value 0.104, OR 1.130, CI 0.975-1.3) were found to be potential predictors of mortality. Out of these PRISM was statistically significant (p value 0.004)

  To the best of our knowledge, this was the first study conducted on respiratory compliance on mechanical ventilator in pediatrics in the region. We recommend multicentric studies on a larger scale to confirm the above findings.

  Limitations of the study

  1. It was a single center study. Multicentric studies on a larger scale are needed to confirm the above findings.
  2. Less no of cases with primary respiratory pathology. A greater number of cases with primarily respiratory system involvement needed.

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S. No	MRD No	NAME	EXTUBATION FAILURE	CSTAT/K AT EXTUBATION	AGE IN MONTHS	AGE IN YEARS	Age group	gender	weight	SOFA	PRISM	RESPIRATORY _YES_NO	RESPIRATORY
1	1437298	A	NO	0.66	168	14	4	MALE	50	1	36	RESPIRATORY	1
2	1433790	P	-	-	96	8	3	FEMALE	29	7	35	NON	0
3	1432640	A	-	-	180	15	4	FEMALE	42	11	40	NON	0
4	1435104	M	-	-	7	0.583333333	1	FEMALE	6.6	5	20	NON	0
5	1432588	J	-	-	108	9	3	MALE	30	10	40	NON	0
6	1432077	S	-	-	2	0.166666667	1	MALE	2.4	12	30	NON	0
7	1430513	M	NO	0.53	2	0.166666667	1	MALE	3.8	10	28	RESPIRATORY	1
8	1464658	M	NO	0.93	36	3	2	FEMALE	15	2	32	RESPIRATORY	1
9	1455163	P	NO	0.74	96	8	3	MALE	19	11	9	NON	0
10	1452502	H	NO	0.52	180	15	4	MALE	75	11	34	RESPIRATORY	1
11	1446952	R	-	-	84	7	3	MALE	19	3	29	NON	0
12	1455212	MT	-	-	3	0.25	1	MALE	5	11	27	NON	0
13	1447338	K	NO	0.58	24	2	2	FEMALE	11	2	32	RESPIRATORY	1
14	1447887	H	NO	1.2	72	6	3	MALE	25	6	32	NON	0
15	1057977	P	NO	1.2	84	7	3	FEMALE	25	0	30	RESPIRATORY	1
16	1443209	G	NO	0.81	24	2	2	FEMALE	12	2	30	RESPIRATORY	1
17	1446743	T	-	-	12	1	1	MALE	10	4	32	NON	0
18	1405312	S	-	-	108	9	3	MALE	22.5	5	9	NON	0
19	1335355	M	NO	0.27	36	3	2	MALE	11	3	9	NON	0
20	1331715	A	NO	0.13	84	7	3	MALE	24	4	15	NON	0
21	1332429	H	YES	0.5	33	2.75	2	FEMALE	17	4	15	RESPIRATORY	1
22	1417592	S	NO	1.03	168	14	4	FEMALE	33	11	25	NON	0
23	148690	S	NO	0.75	60	5	2	MALE	20	2	40	NON	0
24	141050	H	NO	0.77	36	3	2	FEMALE	12	6	24	NON	0
25	1412302	T	-	-	72	6	3	FEMALE	18	6	28	NON	0
26	1407595	G	NO	0.89	168	14	4	MALE	45	3	7	NON	0
27	1355515	T	NO	0.65	72	6	3	MALE	17	0	30	NON	0
28	1412337	P	-	-	1	0.083333333	1	FEMALE	3.5	0	9	NON	0
29	1417566	J	NO	0.58	168	14	4	MALE	45	3	28	RESPIRATORY	1
30	140895	M	YES	0.7	84	7	3	MALE	20	4	33	NON	0
31	1340583	L	NO	1.07	60	5	2	MALE	15	4	12	NON	0
32	1337951	AP	NO	0.76	132	11	4	FEMALE	50	2	12	NON	0
33	1348583	A	NO	0.98	18	1.5	2	FEMALE	9.2	2	7	RESPIRATORY	1
34	1334330	M	NO	0.92	20	1.666666667	2	MALE	10.5	4	14	NON	0
35	1334446	J	NO	0.56	48	4	2	FEMALE	18	10	16	RESPIRATORY	1
36	1359301	P	-	-	10	0.833333333	1	FEMALE	6.8	10	31	NON	0
37	1365238	K	-	-	1	0.083333333	1	MALE	2.12	2	18	RESPIRATORY	1
38	1396453	J	-	-	132	11	4	MALE	25	2	7	NON	0
39	1366195	A	NO	0.65	144	12	4	MALE	23	4	4	NON	0

S. No	MRD No	NAME	PRIMARY DIAGNOSIS	DIAGNOSIS	ASSOSIATED DIAGNOSIS	COMPLICATIONS	SPECIFICATION OF COMPLICATIONS	ORGANISM	VASOACTIVE MEDIATORS
1	1437298	A	RESPIRATORY	PNEUMONIA	EMPYEMA MYOCARDITIS SEPTIC SHOCK	YES	VAP	KLEIBSEILLA	YES
2	1433790	P	CNS	MENINGOENCEPHALITIS	?HUS?HEMOLTIC ANEMIA AKI RAISED ICP	NO	-	-	NO
3	1432640	A	ENDOCRINE	DIABETES MELLITIS TYPE 1	DKA RESPIRATORY FAILURE AKI SHOCK	NO	-	-	YES
4	1435104	M	RENAL	AKI	MYOCARDITIS SEPSIS	NO	-	-	NO
5	1432588	J	GASTROIN	ACUTE LIVER FAILURE	ENCEPHALOPATHY SCRUB TYPHUS	NO	-	-	YES
6	1432077	S	CVS	CHF	TA VSD	NO	-	-	NO
7	1430513	M	RESPIRATORY	PNEUMONIA	RIGHT LUNG COLLAPSE	NO	-	-	NO
8	1464658	M	RESPIRATORY	ASPIRATION PENUMOINA	VINEGAR INGESTION	YES	VAP	ACHROMOBACTER	NO
9	1455163	P	GASTROIN	ACUTE LIVER FAILURE	HEPATIC ABSCESS RIGHT PLEURAL EFFUSION AKI SEPTIC SHOCK	NO	-	-	YES
10	1452502	H	RESPIRATORY	ARDS	BRONCHOPNEUMONIA HYPERTENSIVE URGENCY	NO	-	-	YES
11	1446952	R	CNS	MENINGOENCEPHALITIS	? TB ? PYOGENIC SEIZURE	NO	-	-	NO
12	1455212	MT	CNS	MENINGOENCEPHALITIS	SEIZURE RAISED ICP BEREBRAL OEDEMA	NO	-	-	YES
13	1447338	K	RESPIRATORY	ARDS	BRONCHOPNEUMONIA	NO	-	-	NO
14	1447887	H	TRAUMA	TBI	A/H/O FALL FROM HEIGHT RESPIRATORY FAILURE	NO	-	-	NO
15	1057977	P	RESPIRATORY	PNEUMONIA	DYSTONIA ASPIRATION PNEUMONIA	NO	-	-	NO
16	1443209	G	RESPIRATORY	ACUTE EXACERBATION OF BRONCHIAL ASTHMA	RESPIRATORY FAILURE	NO	-	-	NO
17	1446743	T	GASTROIN	ACUTE LIVER FAILURE	ENCEPHALOPATHY RESPIRATORY FAILURE	YES	VAP	PSEUDOMONAS AERUGINOSA	NO
18	1405312	S	HEMATO	AIHA	IC BLEED POST CPR AKI RSPIRATORY FAILURE	NO	-	-	YES
19	1335355	M	CNS	MENINGOENCEPHALITIS	-	NO	-	-	NO
20	1331715	A	TRAUMA	TBI	SAH IVH CEREBRAL OEDEMA PARIETAL REGION LACERATION	NO	-	-	YES
21	1332429	H	RESPIRATORY	ACUTE EXACERBATION OF BRONCHIAL ASTHMA	SUPERADDED INFECTION POST CPR	NO	-	-	YES
22	1417592	S	CNS	MENINGITIS	TUBERCULAR RAISED ICP	NO	-	-	NO
23	148690	S	GASTROIN	ACUTE LIVER FAILURE	GRADE 2 ENCEPHALOPATHY INTESTINAL OBSTRUCTION POST OP LAPROTOMY	NO	-	-	NO
24	141050	H	CNS	MENINGOENCEPHALITIS	SHOCK MISC	NO	-	-	YES
25	1412302	T	INFECTION	DENGUE	ENCEPHALOPATHY SHOCK	NO	-	-	YES
26	1407595	G	CNS	MENINGOENCEPHALITIS	RESPIRATORY FAILURE	NO	-	-	NO
27	1355515	T	ONCO	ALL	SEPTIC SHOCK PSEUDOMEMB COLITIS	YES	STOOL CULTURE	C DIFFICLE	YES
28	1412337	P	TRAUMA	TBI	SDH POST CRANIOSTOMY	NO	-	-	NO
29	1417566	J	RESPIRATORY	ARDS	OSTEOMYELITIS	YES	VAP	STAPHYLOCOCCUS	NO
30	140895	M	CNS	STRANGULATION	PULMONARY HEMORRHAGE	NO	-	-	YES
31	1340583	L	POISON	NEUROMUSCULAR SNAKE POISON	PULMONARY HEMORRHAGE	NO	-	-	YES
32	1337951	AP	SURGICAL	INTESTINAL PERFORATION	COMPLICATED ENTERIC FEVER POST OP LAPROSCOPIC REPAIR	YES	BLOOD CULTURE	ACHROMOBACTER	NO
33	1348583	A	RESPIRATORY	PNEUMONIA	ASPIRATION PNEUMONIA	NO	-	-	NO
34	1334330	M	CNS	MENINGOENCEPHALITIS	-	NO	-	-	NO
35	1334446	J	RESPIRATORY	PNEUMONIA	RESPIRATORY FAILURE	NO	-	-	YES
36	1359301	P	CNS	MENINGOENCEPHALITIS	GANGRENE	NO	-	-	YES
37	1365238	K	RESPIRATORY	PNEUMONIA	-	NO	-	-	NO
38	1396453	J	CVS	MYOCARDITIS	AKI	NO	-	-	YES
39	1366195	A	RENAL	CKD	ENCEPHALOPATHY WITH GRADE 2 HTN	NO	-	-	NO

S. No	MRD No	NAME	VASOACIVE MEDICATION USED	DURATION OF IONOTROPES	ARDS	ARDS CLASSIFICATION	ARDS GROUP	OUTCOME	MORATLITY	MORATLITY 1	VENTILATION DAYS	VENTILATION DAYS GROUP	DURATION PICU	PICU STAY	First CS/KG	Last CS/KG
1	1437298	A	NOREPI	2	YES	SEVERE	3	DISCHARGE	0	2	7	3	6	1	0.7	-
2	1433790	P	-	-	NO	-	0	DEATH	1	1	8	3	9	2	0.965517241	-
3	1432640	A	NOREPI	11	NO	-	0	DEATH	1	1	11	3	11	2	1.047619048	-
4	1435104	M	-	-	NO	-	0	DAMA	1	1	7	3	8	2	0.606060606	-
5	1432588	J	NOREPI	4	NO	-	0	DAMA	1	1	5	2	4	1	0.633333333	-
6	1432077	S	-	-	NO	-	0	DAMA	1	1	8	3	8	2	1.25	-
7	1430513	M	-	-	YES	SEVERE	3	DISCHARGE	0	2	9	3	13	2	0.263157895	-
8	1464658	M	-	-	NO	-	0	DISCHARGE	0	2	4	2	11	2	0.933333333	-
9	1455163	P	NOREPI	2	NO	-	0	DISCHARGE	0	2	5	2	14	2	0.684210526	-
10	1452502	H	NOREPI	2	NO	-	0	DISCHARGE	0	2	6	2	10	2	0.4	-
11	1446952	R	-	-	NO	-	0	DAMA	1	1	10	3	10	2	1.052631579	-
12	1455212	MT	NOREPI	3	NO	-	0	DAMA	1	1	8	3	9	2	0.4	-
13	1447338	K	-	-	YES	MODERATE	2	DISCHARGE	0	2	10	3	12	2	0.590909091	-
14	1447887	H	-	-	NO	-	0	DISCHARGE	0	2	6	2	9	2	0.8	-
15	1057977	P	-	-	NO	-	0	DISCHARGE	0	2	6	2	8	2	1.2	-
16	1443209	G	-	-	YES	MILD	1	DISCHARGE	0	2	8	3	9	2	0.875	-
17	1446743	T	-	-	NO	-	0	DEATH	1	1	9	3	9	2	0.46	-
18	1405312	S	EPI NOREPI	7	NO	-	0	DAMA	1	1	7	3	7	1	0.666666667	-
19	1335355	M	-	-	NO	-	0	DISCHARGE	0	2	6	2	9	2	0.9	-
20	1331715	A	NOREPI	2	NO	-	0	DISCHARGE	0	2	5	2	14	2	0.958333333	-
21	1332429	H	EPI NOREPI	2	NO	-	0	DISCHARGE	0	2	7	3	12	2	0.882352941	-
22	1417592	S	-	-	NO	-	0	DISCHARGE	0	2	4	2	6	1	0.909090909	-
23	148690	S	-	-	NO	-	0	DISCHARGE	0	2	8	3	13	2	0.6	-
24	141050	H	NOREPI	3	NO	-	0	DISCHARGE	0	2	4	2	13	2	0.833333333	-
25	1412302	T	EPI NOREPI	2	NO	-	0	DEATH	1	1	2	1	4	1	1	-
26	1407595	G	-	-	NO	-	0	DISCHARGE	0	2	4	2	7	1	0.8	-
27	1355515	T	NOREPI	2	NO	-	0	DISCHARGE	0	2	5	2	8	2	0.705882353	-
28	1412337	P	-	-	NO	-	0	DAMA	0	2	6	2	15	3	1.428571429	-
29	1417566	J	-	-	NO	-	0	DISCHARGE	0	2	11	3	14	2	0.688888889	-
30	140895	M	NOREPI	3	NO	-	0	DISCHARGE	0	2	11	3	14	2	0.5	-
31	1340583	L	NOREPI	3	NO	-	0	DISCHARGE	0	2	5	2	8	2	0.653333333	-
32	1337951	AP	-	-	NO	-	0	DISCHARGE	0	2	3	1	3	1	0.76	-
33	1348583	A	-	-	NO	-	0	DISCHARGE	0	2	6	2	10	2	0.293478261	-
34	1334330	M	-	-	NO	-	0	DISCHARGE	0	2	6	2	7	1	1.047619048	-
35	1334446	J	EPI NOREPI	2	YES	MILD	1	DISCHARGE	0	2	11	3	12	2	0.555555556	-
36	1359301	P	EPI NOREPI DOBUTAMINE	5	YES	MILD	1	DEATH	1	1	4	2	5	1	1.029411765	-
37	1365238	K	-	-	NO	-	0	DEATH	1	1	7	3	7	1	1.226415094	-
38	1396453	J	NOREPI DOBUTAMINE	3	NO	-	0	DEATH	1	1	3	1	3	1	1.04	-
39	1366195	A	-	-	NO	-	0	DISCHARGE	0	2	16	3	17	3	0.739130435	-

S. No	MRD No	NAME	Differene	Percentage change	OSI	PEEP A	VT1	PIP1	C1	C2	C3	C4	C5	C6	C7	C8
1	1437298	A	-	-	3.608247423	6	7.64	19	0.7	0.76	0.7	0.64	0.76	0.66	-	-
2	1433790	P	-	-	1.710309278	5	7.655172414	14	0.965517241	1.034482759	1.379310345	1.310344828	1.379310345	1.379310345	1.379310345	-
3	1432640	A	-	-	2.369791667	5	7.452380952	16	1.047619048	0.666666667	1.047619048	1.071428571	0.952380952	1.428571429	0.904761905	0.904761905
4	1435104	M	-	-	5.217391304	6	4.090909091	20	0.606060606	0.454545455	0.378787879	0.727272727	0.757575758	0.757575758	-	-
5	1432588	J	-	-	1.926804124	5	7.333333333	23	0.633333333	0.566666667	0.6	0.666666667	-	-	-	-
6	1432077	S	-	-	2.4375	5	8.333333333	15	1.25	1.625	1.041666667	1.25	1.208333333	1.25	1.666666667	-
7	1430513	M	-	-	7.417582418	6.5	7.368421053	24	0.263157895	0.210526316	0.263157895	0.184210526	0.210526316	0.236842105	0.236842105	0.526315789
8	1464658	M	-	-	2.860215054	5	6.666666667	15	0.933333333	0.92	0.933333333	0.933333333	-	-	-	-
9	1455163	P	-	-	3.125	6	8.894736842	18	0.684210526	0.684210526	0.736842105	0.736842105	-	-	-	-
10	1452502	H	-	-	18.87640449	15	5	31	0.4	0.493333333	0.44	0.533333333	0.52	-	-	-
11	1446952	R	-	-	2.210526316	5.5	8.631578947	16	1.052631579	1	1	1.052631579	1.105263158	1.473684211	0.947368421	0.921052632
12	1455212	MT	-	-	9.130434783	6.5	5	22	0.4	0.4	0.5	0.56	0.86	0.44	0.42	-
13	1447338	K	-	-	4.817204301	7.5	7.727272727	27	0.590909091	0.727272727	0.6	0.563636364	0.472727273	0.636363636	0.745454545	0.672727273
14	1447887	H	-	-	1.65	5	8.76	18	0.8	1.2	1.24	1.2	1.2	-	-	-
15	1057977	P	-	-	2.595833333	5	7.84	17	1.2	1.24	0.88	1.2	1.2	-	-	-
16	1443209	G	-	-	4.731182796	5.5	9.583333333	24	0.875	0.391666667	0.625	0.666666667	0.525	0.833333333	0.808333333	-
17	1446743	T	-	-	4.020618557	5.5	8.6	23	0.46	0.5	0.4	0.69	0.34	0.67	0.21	0.23
18	1405312	S	-	-	4.255319149	7	6.8	18	0.666666667	0.444444444	0.533333333	0.222222222	0.346666667	0.337777778	-	-
19	1335355	M	-	-	1.537113402	5	9.181818182	10	0.9	0.9	0.9	1.272727273	1.27	-	-	-
20	1331715	A	-	-	2.1	5.5	10.04166667	18	0.958333333	1.041666667	1.083333333	1.125	-	-	-	-
21	1332429	H	-	-	4.565217391	7	9.882352941	20	0.882352941	0.941176471	0.941176471	0.823529412	0.823529412	0.941176471	-	-
22	1417592	S	-	-	1.818556701	5	0.909090909	17	0.909090909	1	1.03030303	-	-	-	-	-
23	148690	S	-	-	2.96969697	5	6.05	20	0.6	0.55	0.55	0.55	0.75	0.65	0.65	0.75
24	141050	H	-	-	1.818556701	5	10	20	0.833333333	0.766666667	0.766666667	-	-	-	-	-
25	1412302	T	-	-	6.847826087	7	4.833333333	22	1	-	-	-	-	-	-	-
26	1407595	G	-	-	3.157894737	5	6.666666667	29	0.8	0.888888889	0.888888889	-	-	-	-	-
27	1355515	T	-	-	2.684210526	5	9.411764706	21	0.705882353	0.705882353	0.647058824	0.647058824	-	-	-	-
28	1412337	P	-	-	2.286734694	5.5	8	18	1.428571429	0.571428571	0.485714286	0.2	0.142857143	-	-	-
29	1417566	J	-	-	3.06122449	6.5	7.133333333	21	0.688888889	0.733333333	0.733333333	0.711111111	0.622222222	0.733333333	0.555555556	0.666666667
30	140895	M	-	-	4.926315789	6.5	7.5	23	0.5	0.36	0.48	0.6	0.39	0.75	0.75	0.8
31	1340583	L	-	-	7.826086957	9	7.066666667	22	0.653333333	0.62	0.866666667	0.8	1.066666667	-	-	-
32	1337951	AP	-	-	2.680851064	5	10.46	14	0.76	0.76	-	-	-	-	-	-
33	1348583	A	-	-	6.956521739	7	5	25	0.293478261	0.282608696	0.5	0.47826087	0.97826087	-	-	-
34	1334330	M	-	-	1.93877551	5	5.333333333	21	1.047619048	0.952380952	1.142857143	0.523809524	0.923809524	-	-	-
35	1334446	J	-	-	4.789473684	7.5	6.444444444	19.5	0.555555556	0.166666667	0.427777778	0.55	0.483333333	0.433333333	0.405555556	0.422222222
36	1359301	P	-	-	8.555555556	6	13.23529412	22	1.029411765	0.970588235	2.205882353	2.06	-	-	-	-
37	1365238	K	-	-	2.1875	5	6.603773585	18	1.226415094	1.41509434	1.320754717	1.320754717	1.556603774	1.79245283	-	-
38	1396453	J	-	-	2.216494845	5	8.88	17	1.04	0.96	-	-	-	-	-	-
39	1366195	A	-	-	2.712765957	5	7.826086957	18	0.739130435	0.695652174	0.739130435	0.74	0.782608696	0.826086957	0.956521739	0.52173913

S. No	MRD No	NAME	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22
1	1437298	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1433790	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	1432640	A	0.666666667	0.178571429	-	-	-	-	-	-	-	-	-	-	-	-
4	1435104	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	1432588	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	1432077	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	1430513	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	1464658	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	1455163	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	1452502	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1446952	R	0.842105263	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1455212	MT	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1447338	K	0.581818182	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1447887	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1057977	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1443209	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1446743	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1405312	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1335355	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1331715	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1332429	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1417592	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	148690	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	141050	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	1412302	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	1407595	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	1355515	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	1412337	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	1417566	J	0.577777778	0.577777778	-	-	-	-	-	-	-	-	-	-	-	-
30	140895	M	0.8	0.8	-	-	-	-	-	-	-	-	-	-	-	-
31	1340583	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	1337951	AP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	1348583	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	1334330	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	1334446	J	0.555555556	0.555555556	-	-	-	-	-	-	-	-	-	-	-	-
36	1359301	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-
37	1365238	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-
38	1396453	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-
39	1366195	A	0.52173913	0.826086957	0.695652174	0.652173913	0.339130435	0.47826087	0.608695652	-	-	-	-	-	-	-

S. No	MRD No	NAME	C23	C24	C25	C26	C27	C28	C29	C30	C31	C32	C33	C34	C35	C36	C37
1	1437298	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1433790	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	1432640	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	1435104	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	1432588	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	1432077	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	1430513	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	1464658	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	1455163	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	1452502	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1446952	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1455212	MT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1447338	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1447887	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1057977	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1443209	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1446743	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1405312	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1335355	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1331715	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1332429	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1417592	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	148690	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	141050	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	1412302	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	1407595	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	1355515	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	1412337	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	1417566	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	140895	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	1340583	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	1337951	AP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	1348583	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	1334330	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	1334446	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36	1359301	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
37	1365238	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
38	1396453	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
39	1366195	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

S. No	MRD No	NAME	EXTUBATION FAILURE	CSTAT/K AT EXTUBATION	AGE IN MONTHS	AGE IN YEARS	Age group	gender	weight	SOFA	PRISM	RESPIRATORY _YES_NO	RESPIRATORY
40	1405398	A	-	-	8	0.666666667	1	MALE	10	8	35	NON	0
41	1377625	S	NO	0.88	4	0.333333333	1	FEMALE	5.7	13	25	NON	0
42	1391357	P	-	-	180	15	4	MALE	41	4	18	RESPIRATORY	1
43	1381376	J	-	-	36	3	2	MALE	13	1	21	NON	0
44	1358190	G	NO	1.2	84	7	3	MALE	25	3	12	NON	0
45	1355112	H	NO	1.44	45	3.75	2	MALE	12.5	0	11	NON	0
46	1344427	M	NO	1.25	108	9	3	MALE	20	12	7	RESPIRATORY	1
47	1346996	L	NO	1.27	144	12	4	FEMALE	45	0	18	NON	0
48	1388658	BC	NO	0.3	1	0.083333333	1	MALE	2.3	3	5	NON	0
49	1417009	H	NO	0.65	180	15	4	MALE	69	5	30	NON	0
50	1463980	AK	NO	0.45	192	16	4	FEMALE	40	10	24	NON	0
51	1465381	R	NO	0.55	108	9	3	MALE	25	3	7	NON	0
52	1464004	M	NO	0.2	84	7	3	FEMALE	20	2	24	RESPIRATORY	1
53	1470466	A	-	-	3	0.25	1	MALE	4	5	29	RESPIRATORY	1
54	1483094	S	NO	0.83	168	14	4	MALE	52	6	30	NON	0
55	1472771	M	-	-	36	3	2	MALE	12	0	19	NON	0
56	1476901	S	NO	1	84	7	3	MALE	20	3	26	RESPIRATORY	1
57	1470291	V	-	-	120	10	3	MALE	23	0	6	NON	0
58	1477664	E	NO	0.53	11	0.916666667	1	MALE	7.5	3	30	RESPIRATORY	1
59	1477602	M	NO	0.77	180	15	4	FEMALE	35	8	15	RESPIRATORY	1
60	1333704	G	-	-	17	1.416666667	2	FEMALE	13	0	16	NON	0
61	1480840	F	NO	0.75	4	0.333333333	1	MALE	6.7	6	24	NON	0
62	1484618	A	YES	0.55	12	1	1	MALE	9	8	25	NON	0
63	1466856	P	YES	0.5	60	5	2	FEMALE	22	8	8	NON	0
64	1447348	R	NO	1.43	19	1.583333333	2	MALE	7	2	40	NON	0
65	1436995	A	YES	0.48	72	6	3	FEMALE	16	0	20	NON	0
66	1472830	P	NO	0.73	67	5.583333333	2	FEMALE	16.5	5	26	RESPIRATORY	1
67	1461828	V	NO	0.55	22	1.833333333	2	MALE	11	0	25	RESPIRATORY	1
68	1472003	A	NO	1.13	96	8	3	MALE	23	3	23	NON	0
69	1451207	C	YES	0.58	11	0.916666667	1	FEMALE	10	0	32	RESPIRATORY	1
70	1447490	H	-	-	12	1	1	FEMALE	11	3	29	RESPIRATORY	1
71	1475017	A	NO	0.65	48	4	2	MALE	15	7	27	NON	0
72	1465375	I	-	-	24	2	2	FEMALE	8	9	38	RESPIRATORY	1
73	143710	R	NO	0.73	48	4	2	MALE	15	0	8	NON	0
74	1464509	I	YES	0.5	36	3	2	FEMALE	14	4	35	RESPIRATORY	1
75	1497673	A	NO	0.93	168	14	4	MALE	41	9	28	NON	0
76	1502593	B	NO	1.6	60	5	2	MALE	15	3	29	NON	0
77	1041118	G	NO	0.54	60	5	2	MALE	15	8	20	RESPIRATORY	1

S. No	MRD No	NAME	PRIMARY DIAGNOSIS	DIAGNOSIS	ASSOSIATED DIAGNOSIS	COMPLICATIONS	SPECIFICATION OF COMPLICATIONS	ORGANISM	VASOACTIVE MEDIATORS
40	1405398	A	TRAUMA	TBI	CENTRAL DIABETIC INSIPITUS	NO	-	-	YES
41	1377625	S	CNS	MRSA BRAIN ABSCESS	-	NO	-	-	NO
42	1391357	P	RESPIRATORY	ARDS	VIRAL PNEUMONIA	NO	-	-	NO
43	1381376	J	CNS	MENINGOENCEPHALITIS	-	NO	-	-	NO
44	1358190	G	TRAUMA	TBI	SAH/SDH/RESPIRATORY FAILURE	NO	-	-	NO
45	1355112	H	CNS	COMMUNICATING HYDROCEPHALOUS	POST VP SHUNT WITH RESPIRATORY FAILURE	NO	-	-	NO
46	1344427	M	RESPIRATORY	PNEUMONIA	-	NO	-	-	NO
47	1346996	L	TRAUMA	TBI	FRACTURE LEFT MAXILLARY SINUS/ SAH/ SDH	NO	-	-	NO
48	1388658	BC	SURGICAL	CONGENITAL HYPRTROPHIC PYLORIC STENOSIS	ASPIRATION PNEUMONIA WITH BRONCHOSPASM	NO	-	-	NO
49	1417009	H	INFECTION	DENGUE	SHOCK ENCEPHALOPATHY AKI	NO	-	-	NO
50	1463980	AK	GASTROIN	ACUTE LIVER FAILURE	HEPATIC ENCEPHALOPATHY AKI	NO	-	-	NO
51	1465381	R	NEUROMUSCULAR	LGBS	-	NO	-	-	NO
52	1464004	M	RESPIRATORY	ARDS	TROPICAL FEVER	NO	-	-	NO
53	1470466	A	RESPIRATORY	ARDS	AKI IEM SHOCK RAISED ICP SEIZURE	NO	-	-	NO
54	1483094	S	GASTROIN	ACUTE LIVER FAILURE	AKI ENCEPHALOPATHY HEPATORENAL SYNDROME	NO	-	-	NO
55	1472771	M	GASTROIN	FOREIGN BODY INGESTION	OESOPHAGEAL STRICTURE	NO	-	-	NO
56	1476901	S	RESPIRATORY	PNEUMONIA	HYPOTENSIVE SHOCK	NO	-	-	NO
57	1470291	V	CNS	MEDULLOBLASTOMA	POST OP VP SHUNT SDH HYDOCEPHALOUS VENTRICULOMEGALY	NO	-	-	NO
58	1477664	E	RESPIRATORY	ARDS	BRONCHOPNEUMONIA	NO	-	-	NO
59	1477602	M	RESPIRATORY	PNEUMONIA	AKI SEPSIS TROICAL FEVER	NO	-	-	NO
60	1333704	G	CNS	DRAVIT SYNDROME	ASPIRATION PNEUMONIA	NO	-	-	NO
61	1480840	F	CVS	CHF	VIRAL MYOCARDITIS CARDIOGENIC SHOCK DCMP	NO	-	-	NO
62	1484618	A	CNS	ENCEPHALOPATHY	HYPERNATREMIC DEHYDRATION AKI RESPIRATORY FAILURE	NO	-	-	NO
63	1466856	P	CNS	FEBRILE SEIZURE	BRONCHOSPASM RESPIRATORY FAILURE	NO	-	-	NO
64	1447348	R	GASTROIN	ACUTE LIVER FAILURE	GLOBAL CEREBRAL ISCHEMIA MYOCARDITIS DEVELOPMENTAL DELAY ENCEPHALOPATHY	NO	-	-	NO
65	1436995	A	NEUROMUSCULAR	LGBS	-	NO	-	-	NO
66	1472830	P	RESPIRATORY	PNEUMONIA	TROPICAL FEVER	NO	-	-	NO
67	1461828	V	RESPIRATORY	PNEUMONIA	TROPICAL FEVER RESPIARTORY FAILURE	YES	VAP	ENTEROCOCCUS	NO
68	1472003	A	NEUROMUSCULAR	LGBS	RESPIRATORY FAILURE	NO	-	-	NO
69	1451207	C	RESPIRATORY	ARDS	BRONCHOPNEUMONIA WITH RESPIRATORY FAILURE	YES	VAP	ACINETOBACTER	YES
70	1447490	H	RESPIRATORY	PNEUMONIA	GLOBAL DEVELOPMENTAL DELAY ASPIRATION PNEUMONIA	NO	-	-	NO
71	1475017	A	CNS	MENINGOENCEPHALITIS	-	NO	-	-	NO
72	1465375	I	RESPIRATORY	PNEUMONIA	DOWN SYNDROME AKI ACYNOTIC HEART DISEASE	NO	-	-	NO
73	143710	R	NEUROMUSCULAR	LGBS	-	NO	-	-	NO
74	1464509	I	RESPIRATORY	ARDS	GLOBAL HYPOKINESIA OF LV BRONCHOPNEUMONIA	NO	-	-	NO
75	1497673	A	GASTROIN	ACUTE LIVER FAILURE	ENCEHALOPATHY WITH RESPIRATORY FAILURE	NO	-	-	NO
76	1502593	B	CNS	MENINGOENCEPHALITIS	-	NO	-	-	NO
77	1041118	G	RESPIRATORY	PNEUMONIA	ASPIRATION PNEUMONIA SSPE	NO	-	-	NO

S. No	MRD No	NAME	VASOACIVE MEDICATION USED	DURATION OF IONOTROPES	ARDS	ARDS CLASSIFICATION	ARDS GROUP	OUTCOME	MORATLITY	MORATLITY 1	VENTILATION DAYS	VENTILATION DAYS GROUP	DURATION PICU	PICU STAY	First CS/KG	Last CS/KG
40	1405398	A	EPI NOREPI	2	NO	-	0	DAMA	1	1	4	2	4	1	0.4	-
41	1377625	S	-	-	NO	-	0	DISCHARGE	0	2	5	2	6	1	0.877192982	-
42	1391357	P	-	-	YES	SEVERE	3	DEATH	1	1	5	2	6	1	0.165853659	-
43	1381376	J	-	-	NO	-	0	DAMA	1	1	15	3	15	3	1.384615385	-
44	1358190	G	-	-	NO	-	0	DISCHARGE	0	2	5	2	6	1	1.12	-
45	1355112	H	-	-	NO	-	0	DISCHARGE	0	2	3	1	3	1	1.36	-
46	1344427	M	-	-	YES	MODERATE	2	DISCHARGE	0	2	4	2	4	1	0.15	-
47	1346996	L	-	-	NO	-	0	DISCHARGE	0	2	5	2	7	1	1.111111111	-
48	1388658	BC	-	-	YES	MILD	1	DISCHARGE	0	2	6	2	7	1	0.260869565	-
49	1417009	H	-	-	NO	-	0	DISCHARGE	0	2	11	3	18	3	0.463768116	-
50	1463980	AK	-	-	NO	-	0	DISCHARGE	0	2	10	3	14	2	0.95	-
51	1465381	R	-	-	NO	-	0	DISCHARGE	0	2	4	2	6	1	0.56	-
52	1464004	M	-	-	YES	SEVERE	3	DISCHARGE	0	2	2	1	18	3	0.2	-
53	1470466	A	-	-	YES	SEVERE	3	DEATH	1	1	3	1	2	1	0.15	-
54	1483094	S	-	-	NO	-	0	DISCHARGE	0	2	6	2	8	2	0.615384615	-
55	1472771	M	-	-	NO	-	0	DAMA	1	1	4	2	6	1	1.083333333	-
56	1476901	S	-	-	YES	SEVERE	3	DISCHARGE	0	2	9	3	6	1	0.85	-
57	1470291	V	-	-	NO	-	0	DAMA	1	1	8	3	13	2	1.217391304	-
58	1477664	E	-	-	YES	SEVERE	3	DISCHARGE	0	2	5	2	5	1	0.533333333	-
59	1477602	M	-	-	YES	SEVERE	3	DISCHARGE	0	2	7	3	7	1	0.8	-
60	1333704	G	-	-	NO	-	0	DEATH	1	1	24	3	25	3	0.430769231	-
61	1480840	F	-	-	NO	-	0	DISCHARGE	0	2	9	3	13	2	0.895522388	-
62	1484618	A	-	-	NO	-	0	DAMA	1	1	25	3	26	3	0.422222222	-
63	1466856	P	-	-	YES	SEVERE	3	DEATH	1	1	15	3	17	3	0.454545455	-
64	1447348	R	-	-	NO	-	0	DISCHARGE	0	2	15	3	16	3	1.714285714	-
65	1436995	A	-	-	NO	-	0	DISCHARGE	0	2	26	3	34	3	1.0625	-
66	1472830	P	-	-	YES	SEVERE	3	DISCHARGE	0	2	12	3	15	3	0.606060606	-
67	1461828	V	-	-	YES	SEVERE	3	DISCHARGE	0	2	10	3	19	3	0.509090909	-
68	1472003	A	-	-	NO	-	0	DISCHARGE	0	2	18	3	28	3	0.869565217	-
69	1451207	C	NOREPI	30	YES	SEVERE	3	DEATH	1	1	19	3	28	3	0.47	-
70	1447490	H	-	-	YES	MODERATE	2	DAMA	1	1	9	3	31	3	0.527272727	-
71	1475017	A	0	-	NO	-	0	DISCHARGE	0	2	19	3	26	3	0.8	-
72	1465375	I	-	-	YES	SEVERE	3	DAMA	1	1	8	3	8	2	0.4625	-
73	143710	R	-	-	NO	-	0	DISCHARGE	0	2	28	3	36	3	1.2	-
74	1464509	I	-	-	YES	SEVERE	3	DISCHARGE	0	2	38	3	51	3	0.342857143	0.23
75	1497673	A	-	-	NO	-	0	DISCHARGE	0	2	6	2	10	2	0.853658537	-
76	1502593	B	-	-	NO	-	0	DISCHARGE	0	2	7	3	10	2	1	-
77	1041118	G	-	-	YES	SEVERE	3	DISCHARGE	0	2	6	2	7	1	0.8	-

S. No	MRD No	NAME	Differene	Percentage change	OSI	PEEP A	VT1	PIP1	C1	C2	C3	C4	C5	C6	C7	C8
40	1405398	A	-	-	5.43956044	5.5	9.8	23	0.4	0.4	0.37	-	-	-	-	-
41	1377625	S	-	-	1.757142857	5	6.140350877	12	0.877192982	0.684210526	0.789473684	0.877192982	-	-	-	-
42	1391357	P	-	-	15	9	3.073170732	28	0.165853659	0.195121951	0.180487805	0.131707317	-	-	-	-
43	1381376	J	-	-	1.701	5	7.692307692	20	1.384615385	1.307692308	1.307692308	1.461538462	1.153846154	1.153846154	1.384615385	1.384615385
44	1358190	G	-	-	2.835051546	5	1.08	33	1.12	1.76	1.2	1.2	-	-	-	-
45	1355112	H	-	-	1.761290323	5	7.84	14	1.36	1.44	-	-	-	-	-	-
46	1344427	M	-	-	6.847826087	6.5	4.9	23	0.15	0.225	1.05	1.25	-	-	-	-
47	1346996	L	-	-	2.210526316	5	6.666666667	14	1.111111111	0.822222222	1.266666667	1.266666667	-	-	-	-
48	1388658	BC	-	-	7.173913043	6	0.869565217	22	0.260869565	0.304347826	0.304347826	0.304347826	0.304347826	-	-	-
49	1417009	H	-	-	5.769230769	7.5	5.217391304	21	0.463768116	0.434782609	0.550724638	0.420289855	0.405797101	0.637681159	0.492753623	0.565217391
50	1463980	AK	-	-	1.88125	5	8.75	16	0.95	1	1.125	1.25	1.55	1.45	0.75	1.45
51	1465381	R	-	-	4.46875	8.1	10.44	24	0.56	0.56	0.552	-	-	-	-	-
52	1464004	M	-	-	9.230769231	9	2.5	24	0.2	-	-	-	-	-	-	-
53	1470466	A	-	-	15.46666667	8.5	30	27	0.15	0.1	-	-	-	-	-	-
54	1483094	S	-	-	2.1875	5	7.173076923	21	0.615384615	0.730769231	0.711538462	0.769230769	0.826923077	-	-	-
55	1472771	M	-	-	2.113402062	5	7.333333333	14	1.083333333	0.916666667	0.525	-	-	-	-	-
56	1476901	S	-	-	8.333333333	10	7.7	25	0.85	0.85	0.85	0.8	1.05	1.25	1.15	1
57	1470291	V	-	-	2.552083333	5.5	9.347826087	17	1.217391304	1.434782609	1.434782609	1.347826087	1.652173913	1.695652174	1.347826087	-
58	1477664	E	-	-	3.175257732	5	7.466666667	19	0.533333333	0.666666667	0.613333333	0.533333333	-	-	-	-
59	1477602	M	-	-	2.864583333	6	7.8	21	0.8	0.714285714	0.857142857	1.114285714	0.857142857	0.771428571	-	-
60	1333704	G	-	-	4.242424242	65	5.769230769	22.5	0.430769231	0.484615385	0.5	0.453846154	0.415384615	0.676923077	0.453846154	0.615384615
61	1480840	F	-	-	3.979591837	5	4.179104478	17	0.895522388	0.71641791	0.597014925	0.880597015	0.880597015	0.940298507	0.955223881	0.746268657
62	1484618	A	-	-	2.081632653	5	6.666666667	21	0.422222222	0.466666667	0.566666667	0.555555556	0.588888889	0.222222222	0.555555556	0.3
63	1466856	P	-	-	5.360824742	8	6.454545455	24	0.454545455	0.418181818	0.4	0.454545455	0.436363636	0.454545455	0.4	0.409090909
64	1447348	R	-	-	2.816326531	5.5	11.14285714	18	1.714285714	1.571428571	1.271428571	1.385714286	1.228571429	1.23	1.257142857	1.571428571
65	1436995	A	-	-	1.979166667	5	7.5	14	1.0625	1.125	1.0625	0.6875	0.75	0.75	0.8125	0.875
66	1472830	P	-	-	7.25	6.5	7.696969697	21	0.606060606	0.606060606	0.581818182	0.593939394	0.557575758	0.581818182	0.606060606	0.593939394
67	1461828	V	-	-	5.360824742	7	6.090909091	23	0.509090909	0.545454545	0.7	0.636363636	0.481818182	0.836363636	0.590909091	0.527272727
68	1472003	A	-	-	2.1	5.5	9.130434783	17	0.869565217	0.956521739	0.913043478	0.913043478	1.043478261	1.304347826	1.260869565	1.260869565
69	1451207	C	-	-	9.340659341	8	7.2	28	0.47	0.5	0.45	0.5	0.62	0.38	0.43	0.44
70	1447490	H	-	-	5.380434783	6	6.181818182	22	0.527272727	0.636363636	0.672727273	0.681818182	0.809090909	0.827272727	0.809090909	0.845454545
71	1475017	A	-	-	3.608247423	5	8.2	20	0.8	0.766666667	0.9	0.933333333	0.733333333	0.8	0.733333333	0.733333333
72	1465375	I	-	-	6.021505376	7.4	7.625	25	0.4625	0.4375	0.375	0.3	0.45	0.725	0.4875	-
73	143710	R	-	-	2.268041237	5	9.533333333	16	1.2	1.2	0.933333333	0.666666667	0.8	0.546666667	0.58	0.8
74	1464509	I	-0.112857143	-49.06832298	6.428571429	7.5	5.571428571	23	0.342857143	0.378571429	0.157142857	0.278571429	0.45	0.392857143	0.321428571	0.35
75	1497673	A	-	-	2.293814433	5	8.048780488	16	0.853658537	0.975609756	0.902439024	0.926829268	0.926829268	-	-	-
76	1502593	B	-	-	2.193877551	5	8	19	1	1.133333333	1	1.4	1.6	1.6	-	-
77	1041118	G	-	-	3.125	6	8.666666667	20	0.8	0.6	0.566666667	0.646666667	0.54	-	-	-

S. No	MRD No	NAME	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22
40	1405398	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	1377625	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-
42	1391357	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-
43	1381376	J	1.307692308	1.153846154	0.923076923	0.923076923	0.769230769	1.153846154	-	-	-	-	-	-	-	-
44	1358190	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-
45	1355112	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
46	1344427	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
47	1346996	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
48	1388658	BC	-	-	-	-	-	-	-	-	-	-	-	-	-	-
49	1417009	H	0.652173913	-	-	-	-	-	-	-	-	-	-	-	-	-
50	1463980	AK	1.45	-	-	-	-	-	-	-	-	-	-	-	-	-
51	1465381	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-
52	1464004	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
53	1470466	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-
54	1483094	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-
55	1472771	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
56	1476901	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57	1470291	V	-	-	-	-	-	-	-	-	-	-	-	-	-	-
58	1477664	E	-	-	-	-	-	-	-	-	-	-	-	-	-	-
59	1477602	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
60	1333704	G	0.369230769	0.330769231	0.469230769	0.430769231	0.1	0.1	0.253846154	0.369230769	0.384615385	0.415384615	0.415384615	0.338461538	0.323076923	0.276923077
61	1480840	F	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62	1484618	A	0.555555556	0.511111111	0.511111111	0.444444444	0.444444444	0.5	0.711111111	0.755555556	0.644444444	0.755555556	0.666666667	0.522222222	0.633333333	0.655555556
63	1466856	P	0.368181818	0.431818182	0.4	0.590909091	0.5	0.636363636	-	-	-	-	-	-	-	-
64	1447348	R	1.428571429	1.4	1.428571429	1.428571429	1.571428571	1.428571429	1.4	-	-	-	-	-	-	-
65	1436995	A	1	0.4375	1	0.49375	0.9375	0.9375	0.875	0.31875	0.6875	0.6875	0.6	0.75	0.58125	0.3
66	1472830	P	0.448484848	0.436363636	0.727272727	-	-	-	-	-	-	-	-	-	-	-
67	1461828	V	0.545454545	-	-	-	-	-	-	-	-	-	-	-	-	-
68	1472003	A	1.260869565	1.043478261	1.043478261	1	1.217391304	1.086956522	1.217391304	1.09	1.130434783	-	-	-	-	-
69	1451207	C	0.57	0.5	0.59	0.8	0.54	0.48	0.38	0.4	0.5	0.58	-	-	-	-
70	1447490	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
71	1475017	A	0.8	0.866666667	0.666666667	0.866666667	0.526666667	0.6	0.666666667	0.466666667	0.453333333	0.653333333	-	-	-	-
72	1465375	I	-	-	-	-	-	-	-	-	-	-	-	-	-	-
73	143710	R	0.54	0.8	0.473333333	1.066666667	0.8	1	1.266666667	0.733333333	0.8	0.666666667	1.2	1.066666667	1.2	0.633333333
74	1464509	I	0.535714286	0.585714286	0.428571429	0.428571429	0.285714286	0.342857143	0.307142857	0.235714286	0.214285714	0.357142857	0.214285714	0.25	0.357142857	0.357142857
75	1497673	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-
76	1502593	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-
77	1041118	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-

S. No	MRD No	NAME	C23	C24	C25	C26	C27	C28	C29	C30	C31	C32	C33	C34	C35	C36	C37
40	1405398	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	1377625	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
42	1391357	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
43	1381376	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
44	1358190	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
45	1355112	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
46	1344427	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
47	1346996	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
48	1388658	BC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
49	1417009	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
50	1463980	AK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
51	1465381	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
52	1464004	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
53	1470466	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
54	1483094	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
55	1472771	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
56	1476901	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57	1470291	V	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
58	1477664	E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
59	1477602	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
60	1333704	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
61	1480840	F	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62	1484618	A	0.555555556	0.677777778	-	-	-	-	-	-	-	-	-	-	-	-	-
63	1466856	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
64	1447348	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
65	1436995	A	0.325	0.625	-	-	-	-	-	-	-	-	-	-	-	-	-
66	1472830	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
67	1461828	V	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
68	1472003	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
69	1451207	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
70	1447490	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
71	1475017	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
72	1465375	I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
73	143710	R	1.066666667	1.066666667	0.666666667	0.733333333	0.733333333	-	-	-	-	-	-	-	-	-	-
74	1464509	I	0.257142857	0.357142857	0.342857143	0.378571429	0.321428571	0.342857143	0.321428571	0.235714286	0.5785714	0.5857143	0.45	0.664285714	0.371428571	0.35	0.23
75	1497673	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
76	1502593	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
77	1041118	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

S. No	MRD No	NAME	EXTUBATION FAILURE	CSTAT/K AT EXTUBATION	AGE IN MONTHS	AGE IN YEARS	Age group	gender	weight	SOFA	PRISM	RESPIRATORY _YES_NO	RESPIRATORY
78	1481728	A	NO	0.39	113	9.416666667	3	MALE	7.7	3	24	RESPIRATORY	1
79	1515631	D P	NO	0.1	72	6	3	MALE	20	4	24	NON	0
80	1517851	A	NO	0.58	48	4	2	FEMALE	18	4	26	NON	0
81	1505653	B	NO	0.88	48	4	2	MALE	16	4	26	NON	0
82	1497659	S	NO	0.5	132	11	4	MALE	42	0	28	NON	0
83	1496069	V	-	-	24	2	2	MALE	12	4	38	RESPIRATORY	1
84	1483739	M	NO	0.9	12	1	1	MALE	10	13	30	RESPIRATORY	1
85	1491097	Y	NO	0.35	6	0.5	1	MALE	6	7	28	NON	0
86	153941	AN	NO	1.5	34	2.833333333	2	FEMALE	30	3	15	NON	0
87	1529349	K	NO	1.06	7	0.583333333	1	MALE	6.5	8	20	RESPIRATORY	1
88	1537772	G	NO	1.08	118	9.833333333	3	MALE	26	2	14	NON	0
89	1537322	A	NO	1	48	4	2	MALE	15	1	28	NON	0
90	1529427	O	NO	1.11	12	1	1	MALE	11	5	6	NON	0
91	45071	H	NO	1.29	9	0.75	1	MALE	5.5	2	22	NON	0
92	1527933	R	NO	0.89	2	0.166666667	1	MALE	2.8	6	25	NON	1
93	1531728	A	-	-	72	6	3	FEMALE	20	0	32	NON	0
94	1524512	A	-	-	19	1.583333333	2	FEMALE	10.9	6	35	RESPIRATORY	1
95	1568871	A	-	-	144	12	4	MALE	40	7	35	NON	0
96	1537772	G	NO	0.73	121	10.08333333	3	MALE	30	0	12	NON	0
97	1331711	P	-	-	74	6.166666667	3	FEMALE	20	4	38	RESPIRATORY	1
98	1560253	A	-	-	60	5	2	FEMALE	15.5	4	20	NON	0
99	1537181	A R	YES	0.38	35	2.916666667	2	MALE	19	6	30	NON	0
100	1557453	G	NO	0.88	144	12	4	MALE	42	4	18	NON	0
101	1569345	K	NO	1.8	96	8	3	FEMALE	25	1	26	NON	0
102	1566089	B	-	-	156	13	4	MALE	50	11	8	NON	0
103	1578586	V	NO	1.2	8	0.666666667	1	MALE	10	2	24	NON	0
104	1529384	S	-	-	160	13.33333333	4	MALE	75	11	38	NON	0
105	1529384	K	NO	0.63	0	0	1	MALE	8	9	8	NON	0
106	1557331	D	-	-	156	13	4	FEMALE	50	7	38	NON	0
107	1544211	A	NO	0.58	168	14	4	MALE	45	2	8	NON	0
108	1490946	B	NO	1.4	120	10	3	FEMALE	28	3	19	NON	0
109	1541636	B	NO	0.46	49	4.083333333	2	MALE	3.7	2	18	RESPIRATORY	1
110	1543637	L	NO	1.41	72	6	3	FEMALE	17	3	19	NON	0
111	1542428	B	-	-	83	6.916666667	3	FEMALE	15	11	28	RESPIRATORY	1
112	1590028	V	YES	0.1	7	0.583333333	1	MALE	17	2	25	RESPIRATORY	1
113	1537772	G	-	-	120	10	3	MALE	23	8	18	NON	0
114	1599252	G	-	-	24	2	2	MALE	12	3	6	NON	0

S. No	MRD No	NAME	PRIMARY DIAGNOSIS	DIAGNOSIS	ASSOSIATED DIAGNOSIS	COMPLICATIONS	SPECIFICATION OF COMPLICATIONS	ORGANISM	VASOACTIVE MEDIATORS
78	1481728	A	RESPIRATORY	PNEUMONIA	COMPENSATED SHOCK	NO	-	-	NO
79	1515631	D P	TRAUMA	TBI	EDH WITH POLYTRAUMA RESPIRATORY FAILURE	NO	-	-	NO
80	1517851	A	TRAUMA	TBI	A/H/O DROWNING SEIZURE WITH SHOCK WITH PNEUMOPERICARDIUM	NO	-	-	YES
81	1505653	B	CNS	MENINGOENCEPHALITIS	AKI	NO	-	-	NO
82	1497659	S	NEUROMUSCULAR	LGBS	RESPIRATORY FAILURE	NO	-	-	NO
83	1496069	V	RESPIRATORY	PNEUMONIA	SEIZURE DISORDER BRAINSTEM ENCEPHALITIS	NO	-	-	NO
84	1483739	M	RESPIRATORY	ARDS	FILM ARRAY POSITIVE FOR H INFLUENZA AND ADENOVIRUS CKD	NO	-	-	NO
85	1491097	Y	TRAUMA	TBI	RSPIRATORY FAILURE	NO	-	-	NO
86	153941	AN	CNS	MENINGOENCEPHALITIS	METABOLIC ACIDOSIS WITH AKI WIT RESPIRATORY FAILUE	NO	-	-	NO
87	1529349	K	RESPIRATORY	PNEUMONIA	POST CPR SURVIVOR HYPOTONIC SEIZURE	NO	-	-	YES
88	1537772	G	CNS	MENINGITIS	ABDOMINAL TB RESPIRATORY FAILURE	NO	-	-	NO
89	1537322	A	CNS	MENINGOENCEPHALITIS	AKI TROPICAL FEVER	NO	-	-	NO
90	1529427	O	GASTROIN	ACUTE LIVER FAILURE	HEPATIC ENCEPHALOPATHY WITH REYE LIKE ILLNESS	NO	-	-	NO
91	45071	H	GASTROIN	ACUTE DIARRHEAL DISEASE	BLOOD CULTURE POSITIVE FOR ECOLI /IEM	NO	-	-	NO
92	1527933	R	GASTROIN	ACUTE DIARRHEAL DISEASE	ASPIARTION PNEUMONIA METABOLIC ACIDOSID	NO	-	-	NO
93	1531728	A	CVS	CHF	SCEONDARY DILATED CARDIOMYOPATHY ASPIRATION PNEUMONIA CARDIOGENIC SHOCK	NO	-	-	YES
94	1524512	A	RESPIRATORY	PNEUMONIA	MTW	NO	-	-	NO
95	1568871	A	TRAUMA	TBI	SAH IVH SHOCK PNUEMOTHORAX	NO	-	-	YES
96	1537772	G	CNS	SEIZURE DISORDER	-	NO	-	-	NO
97	1331711	P	RESPIRATORY	PNEUMONIA	K/C/O AML SHOCK FEBRILE NEUTROPENIA	NO	-	-	YES
98	1560253	A	ONCO	WILMS TUMOR	POST NEPHRECTOMY SEPTIC SHOCK	NO	-	-	YES
99	1537181	A R	CNS	SEIZURE DISORDER	AYTPICAL FERILE SEIZURE	NO	-	-	NO
100	1557453	G	POISON	OPC POISON	POST CPR SURVIVOR HYPOTENSIVE	NO	-	-	NO
101	1569345	K	TRAUMA	TBI	POST CPR SURVIVOR ASPIRATION PNEUMONIA	NO	-	-	NO
102	1566089	B	INFECTION	DENGUE	AKI CRRT SHOCK VIRAL HEP A	NO	-	-	YES
103	1578586	V	CVS	MYOCARDITIS	SEPTIC SHOCK AKI	NO	-	-	YES
104	1529384	S	GASTROIN	ACUTE DIARRHEAL DISEASE	FEBRILE NEUTROPRNIA NEUTROPENIC ENTEROCOLITIS POST LAPROTOMY	NO	-	-	YES
105	1529384	K	SURGICAL	INGUINAL HERNIA	CELLULIT ABSCESS POST I&D	NO	-	-	NO
106	1557331	D	GASTROIN	ACUTE LIVER FAILURE	HEP A GRADE 4 HEPATIC ENCEPHALOPATHY COAGLOPATHY PRERENAL AKI	NO	-	-	NO
107	1544211	A	TRAUMA	TBI	POYTAUMA	NO	-	-	NO
108	1490946	B	CNS	SAGITTAL SINUS THROMBOSIS	ULCERATIVE COLITIS	NO	-	-	YES
109	1541636	B	RESPIRATORY	PNEUMONIA	UTI FTT	NO	-	-	NO
110	1543637	L	TRAUMA	TBI	RSA	NO	-	-	NO
111	1542428	B	RESPIRATORY	ARDS	NEPHROTIC SYNDROME WITH AKI	NO	-	-	YES
112	1590028	V	RESPIRATORY	PNEUMONIA	SHOCK	NO	-	-	NO
113	1537772	G	CNS	MENINGITIS	HIE	NO	-	-	NO
114	1599252	G	INFECTION	SEPSIS	MODS DRY GANGRENE HYPOPARATHYRIODISM DIC	NO	-	-	YES

S. No	MRD No	NAME	VASOACIVE MEDICATION USED	DURATION OF IONOTROPES	ARDS	ARDS CLASSIFICATION	ARDS GROUP	OUTCOME	MORATLITY	MORATLITY 1	VENTILATION DAYS	VENTILATION DAYS GROUP	DURATION PICU	PICU STAY	First CS/KG	Last CS/KG
78	1481728	A	-	-	YES	SEVERE	3	DISCHARGE	0	2	2	1	5	1	0.38961039	-
79	1515631	D P	-	-	NO	-	0	DISCHARGE	0	2	16	3	22	3	0.3	-
80	1517851	A	NOREPI EPI	6	NO	-	0	DISCHARGE	0	2	12	3	16	3	0.5	-
81	1505653	B	-	-	NO	-	0	DISCHARGE	0	2	2	1	4	1	0.875	-
82	1497659	S	-	-	NO	-	0	DISCHARGE	0	2	9	3	15	3	0.571428571	-
83	1496069	V	-	-	YES	SEVERE	3	DAMA	1	1	18	3	20	3	0.916666667	-
84	1483739	M	-	-	YES	SEVERE	3	DISCHARGE	0	2	24	3	26	3	0.82	-
85	1491097	Y	-	-	NO	-	0	DISCHARGE	0	2	16	3	21	3	1.56	-
86	153941	AN	-	-	NO	-	0	DISCHARGE	0	2	6	2	9	2	1.666666667	-
87	1529349	K	EPI	2	NO	-	0	DISCHARGE	0	2	20	3	31	3	0.492307692	-
88	1537772	G	-	-	NO	-	0	DISCHARGE	0	2	9	3	11	2	0.961538462	-
89	1537322	A	-	-	NO	-	0	DISCHARGE	0	2	4	2	6	1	1	-
90	1529427	O	-	-	NO	-	0	DISCHARGE	0	2	2	1	5	1	1.109090909	-
91	45071	H	-	-	NO	-	0	DISCHARGE	0	2	7	3	9	2	1.29	-
92	1527933	R	-	-	YES	MILD	1	DISCHARGE	0	2	6	2	10	2	1.071428571	-
93	1531728	A	DOBUTAMINE EPI	7	NO	-	0	DAMA	1	1	7	3	7	1	0.365	-
94	1524512	A	-	-	YES	MODERATE	2	DAMA	1	1	13	3	13	2	0.532110092	-
95	1568871	A	NOREPI	3	NO	-	0	DEATH	1	1	5	2	5	1	0.5	-
96	1537772	G	-	-	NO	-	0	DISCHARGE	0	2	6	2	8	2	0.666666667	-
97	1331711	P	NOREPI	3	NO	-	0	DEATH	1	1	3	1	3	1	0.075	-
98	1560253	A	EPI NOREPI	2	NO	-	0	DEATH	1	1	5	2	4	1	0.522580645	-
99	1537181	A R	-	-	NO	-	0	DISCHARGE	0	2	9	3	15	3	0.526315789	-
100	1557453	G	-	-	NO	-	0	DISCHARGE	0	2	19	3	26	3	0.714285714	-
101	1569345	K	-	-	NO	-	0	DISCHARGE	0	2	4	2	6	1	1.36	-
102	1566089	B	NOREPI	5	NO	-	0	DEATH	1	1	5	2	5	1	0.112	-
103	1578586	V	DOBUTAMINE	2	NO	-	0	DISCHARGE	0	2	12	3	15	3	0.1	-
104	1529384	S	NOREPI EPI	8	NO	-	0	DAMA	1	1	8	3	6	1	0.386666667	-
105	1529384	K	-	-	NO	-	0	DISCHARGE	0	2	3	1	5	1	0.5875	-
106	1557331	D	-	-	NO	-	0	DEATH	1	1	5	2	5	1	0.6	-
107	1544211	A	-	-	NO	-	0	DISCHARGE	0	2	11	3	13	2	0.688888889	-
108	1490946	B	NOREPI	2	NO	-	0	DISCHARGE	0	2	26	3	42	3	1.107142857	-
109	1541636	B	-	-	NO	-	0	DISCHARGE	0	2	21	3	27	3	0.72972973	-
110	1543637	L	-	-	NO	-	0	DISCHARGE	0	2	10	3	8	2	1.117647059	-
111	1542428	B	EPI NOREPI	4	YES	SEVERE	3	DEATH	1	1	4	2	4	1	0.666666667	-
112	1590028	V	-	-	NO	-	0	DEATH	1	1	13	3	12	2	0.105882353	-
113	1537772	G	-	-	NO	-	0	DAMA	1	1	3	1	3	1	1.826086957	-
114	1599252	G	EPI NOREPI	2	NO	-	0	DEATH	1	1	11	3	11	2	0.25	-

S. No	MRD No	NAME	Differene	Percentage change	OSI	PEEP A	VT1	PIP1	C1	C2	C3	C4	C5	C6	C7	C8
78	1481728	A	-	-	3	5	9.87012987	17	0.38961039	-	-	-	-	-	-	-
79	1515631	D P	-	-	9.565217391	7.5	3.9	24	0.3	0.265	0.32	0.6	0.5	0.5	0.46	0.38
80	1517851	A	-	-	11.68539326	8	7.277777778	25	0.5	0.416666667	0.377777778	0.322222222	0.505555556	0.777777778	0.666666667	0.944444444
81	1505653	B	-	-	2.448979592	5.5	8.625	18	0.875	-	-	-	-	-	-	-
82	1497659	S	-	-	2.835051546	6	6.428571429	18	0.571428571	0.642857143	0.523809524	0.595238095	0.595238095	0.571428571	0.5	-
83	1496069	V	-	-	2.448979592	5.5	9.916666667	19	0.916666667	1.083333333	1.333333333	1.083333333	0.833333333	1	0.833333333	0.958333333
84	1483739	M	-	-	1.970103093	5	7.9	16	0.82	0.62	0.6	0.56	0.61	0.67	0.7	0.65
85	1491097	Y	-	-	1.775257732	5	14.5	13	1.56	1.22	1.17	1.17	1.58	0.62	1.27	1.17
86	153941	AN	-	-	1.542857143	6	2.6	14	1.666666667	1.5	1.566666667	1.5	1.533333333	-	-	-
87	1529349	K	-	-	3.06122449	5	5.538461538	17	0.492307692	0.476923077	0.461538462	0.184615385	0.615384615	0.769230769	0.923076923	0.984615385
88	1537772	G	-	-	2.222222222	5	8.384615385	18	0.961538462	1.038461538	1	1.115384615	1.115384615	1.038461538	1.076923077	1.076923077
89	1537322	A	-	-	2.268041237	5	11	18	1	1	1	-	-	-	-	-
90	1529427	O	-	-	1.607142857	5	13.54545455	17	1.109090909	-	-	-	-	-	-	-
91	45071	H	-	-	2.095918367	5	21.45454545	13	1.29	1.29	1.054545455	0.981818182	1.018181818	1.290909091	-	-
92	1527933	R	-	-	2.285714286	5	28.57142857	17	1.071428571	1.214285714	1.071428571	0.714285714	0.892857143	-	-	-
93	1531728	A	-	-	14.58333333	7	5.7	22	0.365	0.65	0.7	0.7	-	-	-	-
94	1524512	A	-	-	7.142857143	7	6.605504587	25	0.532110092	0.504587156	0.458715596	0.550458716	0.513761468	0.29	0.293577982	0.348623853
95	1568871	A	-	-	2.604166667	5	7.025	21	0.5	0.5	0.45	0.575	-	-	-	-
96	1537772	G	-	-	2.608247423	5	7.566666667	20	0.666666667	0.7	0.733333333	0.733333333	0.733333333	-	-	-
97	1331711	P	-	-	6.043956044	6	5	25	0.075	0.135	-	-	-	-	-	-
98	1560253	A	-	-	2.033684211	5	6.451612903	18	0.522580645	0.561290323	0.496774194	0.451612903	-	-	-	-
99	1537181	A R	-	-	5.567010309	6.5	5	19	0.526315789	0.473684211	0.421052632	0.684210526	0.384210526	0.947368421	1	-
100	1557453	G	-	-	2.357142857	5	8.214285714	27	0.714285714	0.69047619	0.714285714	0.80952381	0.761904762	1	1	1.333333333
101	1569345	K	-	-	1.70625	5	9.96	15	1.36	1.48	1.8	-	-	-	-	-
102	1566089	B	-	-	10.76923077	7	5.42	23	0.112	0.38	0.42	0.42	-	-	-	-
103	1578586	V	-	-	5.652173913	5.5	14	22	0.1	0.12	0.17	0.56	0.5	0.4	0.9	1
104	1529384	S	-	-	3.75	5.5	4.066666667	22	0.386666667	0.4	0.4	0.266666667	0.2	-	-	-
105	1529384	K	-	-	4.184782609	6.5	7.25	20	0.5875	0.625	-	-	-	-	-	-
106	1557331	D	-	-	2.1875	5	7.2	21	0.6	0.64	0.6	0.62	-	-	-	-
107	1544211	A	-	-	3.06122449	6	11.11111111	27	0.688888889	0.577777778	0.711111111	0.755555556	0.733333333	1.066666667	0.888888889	0.777777778
108	1490946	B	-	-	1.905154639	5	6.642857143	16	1.107142857	1.178571429	1.214285714	1.25	1.321428571	1.214285714	1.607142857	1.607142857
109	1541636	B	-	-	2.577319588	5.5	6.486486486	18	0.72972973	0.702702703	0.756756757	0.810810811	0.945945946	0.513513514	0.459459459	0.378378378
110	1543637	L	-	-	3.473684211	7	8.823529412	24	1.117647059	1.058823529	1.058823529	1	0.882352941	0.882352941	1.352941176	1.294117647
111	1542428	B	-	-	19.09090909	14	7.8	30	0.666666667	0.586666667	0.58	-	-	-	-	-
112	1590028	V	-	-	4.329896907	5.5	1.941176471	27	0.105882353	0.117647059	0.117647059	0.164705882	0.188235294	0.188235294	0.2	0.223529412
113	1537772	G	-	-	2.333333333	5	8.695652174	22	1.826086957	1.652173913	-	-	-	-	-	-
114	1599252	G	-	-	2.425	5	11.66666667	19	0.25	0.333333333	0.29	0.35	0.416666667	0.35	0.416666667	0.483333333

S. No	MRD No	NAME	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22
78	1481728	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-
79	1515631	D P	0.31	0.335	0.06	0.54	0.29	0.115	0.1	-	-	-	-	-	-	-
80	1517851	A	0.833333333	0.555555556	0.583333333	-	-	-	-	-	-	-	-	-	-	-
81	1505653	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-
82	1497659	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-
83	1496069	V	0.916666667	0.916666667	1	1.25	1	1	1.25	1.5	1.5	-	-	-	-	-
84	1483739	M	0.53	0.75	0.31	0.43	0.64	0.71	0.7	0.83	0.35	0.64	0.68	0.83	1	1
85	1491097	Y	1.15	1.08	0.9	1	1.42	1	0.7	0.83	0.35	-	-	-	-	-
86	153941	AN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
87	1529349	K	0.953846154	1	0.953846154	1.076923077	1.107692308	1.061538462	0.907692308	0.984615385	1.061538462	1.061538462	-	-	-	-
88	1537772	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-
89	1537322	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-
90	1529427	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-
91	45071	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
92	1527933	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-
93	1531728	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-
94	1524512	A	0.348623853	0.357798165	0.385321101	0.394495413	-	-	-	-	-	-	-	-	-	-
95	1568871	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-
96	1537772	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-
97	1331711	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-
98	1560253	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-
99	1537181	A R	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	1557453	G	0.833333333	0.80952381	0.880952381	0.738095238	0.714285714	0.952380952	0.976190476	0.880952381	0.880952381	0.857142857	0.880952381	-	-	-
101	1569345	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-
102	1566089	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-
103	1578586	V	1.1	1.2	1.2	-	-	-	-	-	-	-	-	-	-	-
104	1529384	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-
105	1529384	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-
106	1557331	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-
107	1544211	A	0.666666667	0.577777778	-	-	-	-	-	-	-	-	-	-	-	-
108	1490946	B	1.571428571	1.571428571	1.821428571	1.857142857	1.678571429	1.464285714	1.5	1.964285714	2	1.607142857	1.071428571	1.142857143	1.071428571	1.428571429
109	1541636	B	0.675675676	0.702702703	0.783783784	0.648648649	0.594594595	0.648648649	0.675675676	0.486486486	0.27027027	0.486486486	0.459459459	0.459459459	-	-
110	1543637	L	1.411764706	-	-	-	-	-	-	-	-	-	-	-	-	-
111	1542428	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-
112	1590028	V	0.205882353	0.229411765	0.164705882	0.117647059	0.047058824	-	-	-	-	-	-	-	-	-
113	1537772	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-
114	1599252	G	0.491666667	-	-	-	-	-	-	-	-	-	-	-	-	-

S. No	MRD No	NAME	C23	C24	C25	C26	C27	C28	C29	C30	C31	C32	C33	C34	C35	C36	C37
78	1481728	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
79	1515631	D P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
80	1517851	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
81	1505653	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
82	1497659	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
83	1496069	V	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
84	1483739	M	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
85	1491097	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86	153941	AN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
87	1529349	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
88	1537772	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
89	1537322	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
90	1529427	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
91	45071	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
92	1527933	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
93	1531728	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
94	1524512	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
95	1568871	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
96	1537772	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
97	1331711	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
98	1560253	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
99	1537181	A R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	1557453	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
101	1569345	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
102	1566089	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
103	1578586	V	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
104	1529384	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
105	1529384	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
106	1557331	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
107	1544211	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
108	1490946	B	1.142857143	1.142857143	-	-	-	-	-	-	-	-	-	-	-	-	-
109	1541636	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
110	1543637	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
111	1542428	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
112	1590028	V	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
113	1537772	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
114	1599252	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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No. BFUHS/2K23p-TH/ 26 **Date** 1/1/24

The Principal
Dayanand Medical College & Hospital
Ludhiana

Subject:: Approval of Plan of Thesis.

This is to inform you that the Faculty of Medical Sciences in its meeting held on 25.09.2023 has approved the plan of thesis of **Asmita Aggarwal**, a student of your college for **MD Paediatrics** along with the names of Supervisor/Co-Supervisor as under:-

Topic Plan of Thesis
Respiratory compliance in children on mechanical ventilation .

Supervisor
Dr. Puneet Aulakh Pooni
Prof. & Head
Dept. of Paediatrics

Co-Supervisor:-
Dr. Siddharth Bhargava
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The student may submit the thesis in triplicate alongwith the plan in triplicate also, to the Controller of Examinations, BFUHS, Faridkot, at least six months before the commencement of theory examination, if he/she is otherwise eligible to take the examination. He /She may be directed to attach a photocopy of this letter with the forwarding letter while submitting thesis in the University along with the letter of approval of University for change of supervisor/Co-Supervisor, change of topic, if any.

Controller of Examinations

Note :

1. *If any discrepancy found regarding topic of thesis or Supervisor/Co-Supervisor, inform undersigned within one month after issue of this letter.*

RESPIRATORY COMPLIANCE IN CHILDREN ON MECHANICAL VENTILATION

THESIS PROPOSAL

FOR APPROVAL OF SUBJECT OF THESIS TO BE SUBMITTED IN

PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

MD

In

PAEDIATRICS

OF THE

BABA FARID UNIVERSITY OF HEALTH SCIENCES

FARIDKOT

AUGUST, 2022

DR. ASMITA AGGARWAL

DEPARTMENT OF PAEDIATRICS
DAYANAND MEDICAL COLLEGE AND HOSPITAL
LUDHIANA

ABSTRACT OF PLAN OF THESIS

Title	RESPIRATORY COMPLIANCE IN CHILDREN ON MECHANICAL VENTILATION
For the degree of	MD PEDIATRICS
Name of the candidate	Dr. Asmita Aggarwal
Supervisor	Dr. Puneet Aulakh Pooni, Professor & Head, Department of Pediatrics, DMCH, Ludhiana
Co-Supervisor	Dr. Siddharth Bhargava, Associate Professor, Department of Pediatrics, DMCH, Ludhiana
Institution	Dayanand Medical College and Hospital, Ludhiana
University	Baba Farid University of Health Sciences, Faridkot

Introduction: A ventilator is an automatic mechanical device designed to move gas in and out of the lungs. The main properties of respiratory mechanics are compliance and resistance. Compliance (C) describes the elastic property of the respiratory system including the lung and the chest wall. Static compliance (CSTAT) is the ratio between the change in volume (VT) and the corresponding change in transmural pressure (ΔP). The change in transmural pressure can be calculated as the difference between plateau pressure (PPLAT) and total PEEP (PEEPTOT) measured by an end-inspiratory and end-expiratory occlusion, respectively.

CSTAT = VT/ΔP = VT/ (PPLAT - PEEPTOT)

Aims and Objectives: To study the compliance of lungs in children requiring MV and to correlate Compliance with duration of ventilation, PICU stay, final outcome in critically ill patients admitted in PICU of Dayanand Medical College and Hospital, Ludhiana.

Materials and Methods: Prospective, non-interventional, observational study in 10 bedded level 3 PICU. Patients with age group >1 month to 18 years requiring ventilatory support for > 24 hours will be enrolled in the study. Outcome in relation to duration of need of ventilatory support, PICU stay and mortality will be noted. Appropriate statistical methods will be used to analyze the result.

Clinical significance: The compliance of lungs would determine the duration of ventilation and the worsening of compliance would mean respiratory failure. In children, primarily Pressure control mode is used in which compliance can be checked (C static displayed on ventilator) but not resistance. This study will be done to know Compliance of lung in children requiring MV and to correlate it with the outcome including duration of ventilation, PICU stay and mortality.

Keywords: Mechanical ventilation, Compliance, Pediatric intensive care, duration of ventilatory support, PICU stay, Mortality.

(Signature) Candidate	(Signature) Co-supervisor	(Signature) Supervisor	(Signature) Principal

CERTIFICATE OF FACILITIES AVAILABLE

This is to certify that the facilities for work on the subject of thesis titled **"RESPIRATORY COMPLIANCE IN CHILDREN ON MECHANICAL VENTILATION"** exist in the Department of Pediatrics at Dayanand Medical College and Hospital, Ludhiana and will be provided to the candidate. We will see that the data being included in the thesis are genuine and is collected by the candidate herself under our supervision and guidance.

Supervisor

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Head of the Department

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Place : _____

Date : _____

APPROVAL PROFORMA
BY
RESEARCH & ETHICAL COMMITTEE
DAYANAND MEDICAL COLLEGE & HOSPITAL, LUDHIANA

Name of candidate	Dr. Asmita Aggarwal
Department	Pediatrics
Topic of Thesis	RESPIRATORY COMPLIANCE IN CHILDREN ON MECHANICAL VENTILATION
Likely date of appearing in PG examination	May/ June, 2024
Date of enrollment	7th March 2022
Name of Head of Department	Dr. Puneet Aulakh Pooni
1) Supervisor **2) Co-Supervisor**	Dr. Puneet Aulakh Pooni Dr. Siddharth Bhargava
Signature of Members of Research Committee with Stamp	**Signature of Members of Ethics Committee with Stamp**
Dr. Harpreet Kaur (Professor & Head, Pathology)	Mr. R K Sharma (Legal Expert)
Dr. Jaspal Singh (Professor & Head, Surgery)	Dr. Ramit Mahajan (Associate Professor, Gastroenterology)
Dr. Dinesh Gupta (Professor & Head, Medicine)	Dr. Anu Sharma (Professor, Anatomy)
Dr. Sandeep Kaushal (Dean Academics & Professor & Head, Pharmacology)	Dr. Sandeep Kaushal (Dean Academics & Professor & Head, Pharmacology)
Dr. Gurpreet S Wander (Vice Principal)	Dr. Gurpreet S Wander (Vice Principal & Professor & Head, Cardiology)
	Dr. Gagandeep Singh (Secretary, Ethics Committee Professor & Head, Neurology)

Approved: Yes / ~~No~~

Dr. Sandeep Puri
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Research Committee

Chairperson
Research Committee

Approved: Yes / ~~No~~

Prof. Arvind Malhotra
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Ethics Committee

Chairperson
Ethics Committee

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PROFORMA FOR REGISTRATION OF SUBJECT FOR DISSERTATION

1	NAME OF THE CANDIDATE AND ADDRESS	Asmita Aggarwal House no-971, Sector- 7, Urban Estate, Ambala City Haryana 134003
2	NAME OF THE INSTITUTE	Dayanand Medical College and Hospital, Ludhiana
3	COURSE OF STUDY AND SUBJECT	MD Pediatrics
4	DATE OF ADMISSION OF COURSE	7th March 2022
5	TITLE OF THE TOPIC	Respiratory compliance in Children on Mechanical Ventilation

6. BRIEF RESUME OF THE INTENDED WORK

6.1 NEED FOR THE STUDY

A ventilator is an automatic mechanical device designed to move gas in and out of the lungs. Simple, compressed air and oxygen from the wall is introduced into a ventilator with a blender, which can deliver a set FiO2. This air oxygen mixture is then humidified and warmed in a humidifier and delivered to the infant by the ventilator via the breathing circuit. The peak inspiratory pressure (PIP) or tidal volume (Vt), positive end expiratory pressure (PEEP), inspiratory time and respiratory rate are set on the ventilator. The closing of the exhalation valve initiates a positive pressure mechanical breath. At the end of the preset inspiratory time, the exhalation valve is opened, permitting the infant to exhale. If this end is partly occluded during expiration, a PEEP is generated in the circuit proximal to the occlusion (or CPAP if the infant is breathing spontaneously). Expiration is passive and gas continues to flow delivering the set PEEP.[1] One in every 3 patients admitted to the PICUs requires ventilatory support. The Acute respiratory failure (ARF) is the most common reason for mechanical ventilation (MV) and survival of unselected infants and children receiving MV for more than 12 h is 85%.[2]

The main properties of respiratory mechanics are compliance and resistance.

Compliance (C) describes the elastic property of the respiratory system including the lung and the chest wall. Static compliance (CSTAT) is the ratio between the change in volume (VT) and the corresponding change in transmural pressure (ΔP).

The change in transmural pressure can be calculated as the difference between plateau pressure (PPLAT) and total PEEP (PEEPTOT) measured by an end-inspiratory and end-expiratory occlusion, respectively.

CSTAT = VT/ΔP = VT/ (PPLAT - PEEPTOT)

The dimension of compliance is usually ml/cmH2O.[3,4]

In adult patients with a normal lung undergoing mechanical ventilation, CSTAT is 50–60 ml/cmH2O.[5] Lung compliance changes with age,

body position, and various pathological entities. Decreased compliance may occur in the case of ARDS, atelectasis, pneumothorax, lung fibrosis, or chest-wall stiffness. ARDS patients typically have a CSTAT of around 35–45 ml/cmH2O in adults on admission. CSTAT decreases with ARDS severity; therefore, monitoring compliance in ARDS patients can provide information about the volume of the aerated lung. An increase in compliance occurs in the case of lung emphysema which is not seen in children.[6] Hence studying Compliance will help us assess and diagnose lung conditions, impairments and adjust ventilatory settings.

Resistance (R) describes the opposition to a gas flow entering the respiratory system during inspiration, which is caused by frictional forces. Resistance is calculated as the ratio between the pressure driving a given flow and the resulting flow rate ($\dot{V}$). $R = \Delta P / \dot{V}$.

The resistance of the respiratory system is primarily made up of the resistance of the airways and the endotracheal tube because the resistance of the lung tissue is low. In mechanically ventilated patients with a normal lung and an artificial airway, inspiratory resistance (RINSP) is 10–15 cmH2O

A narrow endotracheal tube or use of a heat and moisture exchanger (HME) may cause an increase in RINSP, which increases with flow in an exponential relationship Incorrect positioning or kinking of the endotracheal tube may also increase RINSP. Increased airway resistance occurs in the case of COPD or asthma.[6] Resistance can only be calculated in volume-control mode with a constant flow rate during inspiration so resistance has been excluded from this study. According to the study of Airway Resistance and Respiratory Compliance in Children with Acute Viral Bronchiolitis Requiring Mechanical Ventilation Support by Cinara Andreolio, Jefferson P Piva, Francisco Bruno, Tais S da Rocha, Pedro CR Garcia Monitoring respiratory mechanics could represent a useful tool to guide the ventilatory strategy to be adopted in patients with Acute viral brocholitis.[7]

Respiratory mechanics including compliance and resistance have been studied in adults. In children as the cause of Respiratory failure is varied and there are no studies on compliance and resistance in children having respiratory failure due to all causes. The compliance of lungs would determine the duration of ventilation and the worsening of compliance would mean respiratory failure. In children, primarily Pressure control mode is used in which compliance can be checked (C static displayed on ventilator) but not resistance. This study will be done to know Compliance of lungs in children requiring MV and to correlate it with the outcome including duration of ventilation, PICU stay and mortality.

6.2 REVIEW OF LITERATURE

In a study by Nadir Yehya and Neal J. Thomas Improvements in oxygenation, but not in respiratory mechanics, were associated with lower mortality in pediatric acute respiratory distress syndrome.[8] Another study where Potentially modifiable factors contributing to outcome from acute respiratory distress syndrome were studied stated Higher PEEP, lower peak, plateau, and driving pressures, and lower respiratory rate are associated with improved survival from ARDS.[9]

In an article published in American journal of respiratory and critical care medicine, Patients with ARDS managed with lower PEEP relative to F_{IO2} than recommended by the ARDSNet model had higher mortality. Clinical trials targeting PEEP management in ARDS are needed.[10]

According to another study monitoring the mechanical properties (both static and dynamic) of the respiratory tract is essential for the diagnosis and prognosis of the disease causing any condition and to take the pertinent therapeutic decisions.[11]

Another study states analysis of respiratory mechanics of infants with severe bronchiolitis receiving MV shows that the elastic component of the working pressure of the respiratory system is the most important. A better understanding of lung mechanics in this group of patients may lead to change the traditional ventilatory approach to severe bronchiolitis.[12]

Ready access to physiologic measures, including Respiratory mechanics, lung volumes, and ventilation/perfusion inhomogeneity, could optimize the clinical management of the critically ill pediatric or neonatal patient and minimize lung injury.[13]

The choice of mechanical ventilation strategy can significantly influence the subsequent course of lung injury. Mechanical ventilation can no longer be viewed simply as a harmless support modality that is employed to keep patients alive while disease-specific treatments are used to ameliorate the underlying pathology.[14]

The benefits and harms of mechanical ventilation in critically ill patients with uninjured or injured lungs, as well as in patients undergoing

general anesthesia, depend not only on ventilator settings, but also on the interpretation of ventilator-derived parameters. Both parameters adjusted by the operator and ventilator-derived parameters need to be strictly monitored at bedside, in order to develop a case-by-case approach to mechanical ventilation. Furthermore, additional clinical studies are required to ascertain the safe thresholds of each of these parameter in injured and uninjured lungs.[15]

In a study conducted by Gopinathannair Harikumar, Anne Greenough and Gerrard F Rafferty, the value of such measurements in predicting the outcome of weaning and extubation has been limited , but respiratory system compliance and resistance, provide information about underlying lung pathology and the load that is imposed on the respiratory muscles.[16]

Another study addresses the need for more studies in pediatric ventilation and states that Pediatric practitioners face unique challenges when attempting to translate or adapt adult-derived evidence regarding ventilation practices for acute lung injury or acute respiratory distress syndrome into pediatric practice.[17]

Study conducted by European Society of Pediatric and Neonatal Intensive Care reveals that there is inconsistent mechanical ventilation practice and use of adjunctive therapies in children with acute lung injury. Pediatric clinical trials assessing mechanical ventilation management are needed to generate evidence to optimize outcomes. They estimate that a large number of centers are needed to conduct such trials; it is imperative, therefore, to bring about international collaboration.[18]

Despite the improvement observed in the last decades in the treatment of pediatric acute respiratory failure and the diffusion of innovative modes of mechanical ventilation, there are no clear and consistent guidelines for the use of mechanical ventilation for children. In several areas data are still lacking, and in many others they are extrapolated from studies performed in adults; the direct evaluation of results obtained from studies specific to the pediatric population is therefore crucial.[19]

Pediatric acute respiratory distress syndrome (PARDS) remains a significant cause of morbidity and mortality, with mortality rates as high as 50% in children with severe PARDS. Despite this, pediatric lung injury and mechanical ventilation has been poorly studied, with the majority of investigations being observational or retrospective and with only a few randomized controlled trials to guide intensivists. The most recent and universally accepted guidelines for pediatric lung injury are based on consensus opinion rather than objective data. Therefore, most neonatal and pediatric mechanical ventilation practices have been arbitrarily adapted from adult protocols, neglecting the differences in lung pathophysiology, response to injury, and co-morbidities among the three groups. Low tidal volume ventilation has been generally accepted for pediatric patients, even in the absence of supporting evidence. No target tidal volume range has consistently been associated with outcomes, and compliance with delivering specific tidal volume ranges has been poor. Similarly, optimal PEEP has not been well-studied, with a general acceptance of higher levels of F_iO_2 and less aggressive PEEP titration as compared with adults. Other modes of ventilation including airway pressure release ventilation and high frequency ventilation have not been studied in a systematic fashion and there is too little evidence to recommend supporting or refraining from their use. There have been no consistent outcomes among studies in determining optimal modes or methods of setting them. In this review, the studies performed to date on mechanical ventilation strategies in neonatal and pediatric populations will be analyzed. There may not be a single optimal mechanical ventilation approach, where the best method may simply be one that allows for a personalized approach with settings adapted to the individual patient and disease pathophysiology. The challenges and barriers to conducting well-powered and robust multi-institutional studies will also be addressed, as well as reconsidering outcome measures and study design.[20]

Another study by Grinnan DC and Truwit JD states Pulmonary disease changes the physiology of the lungs, which manifests as changes in

respiratory mechanics. Therefore, measurement of respiratory mechanics allows a clinician to monitor closely the course of pulmonary disease. Here we review the principles of respiratory mechanics and their clinical applications. These principles include compliance, elastance, resistance, impedance, flow, and work of breathing.[21]

Dynamic and static respiratory mechanics are analysed to highlight all those data that can influence decision-making in setting mechanical or assisted ventilation in invasively and non-invasively ventilated patients.[22]

Another study quotes that in mechanical ventilation, invasive and noninvasive, the knowledge of respiratory mechanic physiology is indispensable to take decisions and into the efficient management of modern ventilators. Monitoring of pulmonary mechanic parameters has been recommended from all the review works and clinical research.. Monitoring pulmonary mechanics in patients under mechanical ventilation in intensive care units gives relevant informations and should be implemented in a rational and systematic way.[23]

6.3 AIMS AND OBJECTIVES OF THE STUDY

- To study the compliance of lung in children requiring MV
- To correlate Compliance with duration of ventilation, PICU stay, final outcome

7. MATERIALS AND METHODS

This is a Prospective, Non-Interventional, Observation study.to be conducted in the Pediatric Intensive Care Unit of a Tertiary care hospital, DMCH Ludhiana between July 1 2022 to September 30, 2023.

7.1 Source of Data:

Source of data will be Pediatric patients (1 month-18 years) requiring Mechanical ventilatory support for >24 hours in the Pediatric ICU, DMCH, Ludhiana.

7.2 METHOD OF COLLECTION OF DATA

To standardize the measurements, we have decided to evaluate these variables from the second day. The measurements will not be performed on the first day of MV because of the adjustments that are usually required in the first 24 hours of MV support. Values will be taken by pressing the inspiratory pause which is situated on ventilatory panel. All the parameters on ventilator and compliance will be noted by inspiratory hold twice a day. The outcome variables like Peak inspiratory pressure(PIP), Mean airway pressure(MAP), Positive end expiratory pressure(PEEP), Tidal volume(TV) and Compliance will be recorded. Mechanical ventilation support will be provided with the Nellcor Puritan Bennett 840 Ventilator system.

Inclusion Criteria:

- For 15 months, pediatric patients (1 month-18 years) admitted to the PICU with clinical diagnosis of Respiratory failure and requiring MV support for >24 hours will be included in the study.

Exclusion Criteria:

- Those requiring ventilator for less than 24 hours and in scenarios where the inspiratory pause is not possible due to spontaneous breathing will be excluded from this study.

CONSENT

Written consent will be obtained from the attendants of the children. Patients will be assessed appropriately, and data will be collected on specified patient proforma including information such as age, sex,

duration of stay on ventilator, inotropes used, mortality, ventilatory mode, and the cumulative fluid overload.

OUTCOME

To study the association of Respiratory compliance in Children on Mechanical Ventilator with duration of need of ventilatory support, PICU stay and mortality.

STATISTICAL ANALYSIS

Data will be described in terms of range; mean ±standard deviation (± SD), median, frequencies (number of cases) and relative frequencies (percentages) as appropriate. To determine whether the data is normally distributed, a Kolmogorov-Smirnov test will be used. Comparison of quantitative variables between the groups will be done using Student t-test and Mann Whitney U test for independent samples for parametric and non-parametric data respectively. For comparing categorical data, Chi square ($\chi 2$) test will be performed. A probability value (p value)less than 0.05 will be considered statistically significant. All statistical calculations will be done using (Statistical Package for the Social Science) SPSS 21version (SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows.

7.3 DOES THE STUDY REQUIRE ANY INVESTIGATIONS OR INTERVENTIONS TO BE CONDUCTED ON PATIENTS OR OTHER HUMANS OR ANIMALS? IF SO, PLEASE DESCRIBE BRIEFLY.

No

7.4 HAS ETHICAL CLEARANCE BEEN OBTAINED FROM YOUR INSTITUTION IN CASE OF 7.3?

Yes, Attached herewith

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PERFORMA

S No.:

Name: **Age:** **Gender:**

MRD No.: **Admission No.:**

Date of admission: **Date of admission:**

(in hospital) **(in PICU)**

Chief Complaints:

HISTORY OF PRESENTING ILLNESS:

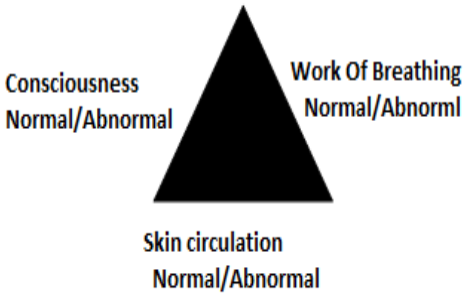
PAST HISTORY:

Anthropometry:

	Actual	Expected	Remarks
WEIGHT			
HEIGHT			
BMI			
HC(<5YEARS)			

Signature of Candidate **Signature of Supervisor**

Pediatric Assessment Triangle (PAT)



Detailed Clinical Assessment (ABCDE)

AIRWAY • Open & Stable • Open but Unstable • Obstruction	**BREATHING** *RR…… /Min* *Efforts Normal Poor Increased Acidotic* *Air Entry Normal Poor Differential* *Auscultation None Stridor Wheeze Crackl* *SpO_2 (room air)……:……* *SpO_2 (0n oxygen)……*	**CIRCULATION** HR……. /Min Central Pulse Good Poor Peripheral Pulse Good Poor CFT ……BP……. Skin Temp Warm Cool ECG: Rhythm……. T-wave……Others……

DISABILITY *A V P U GCS E V M* *Pupil size……Reaction……..* *Motor Activity Normal & symmetrical* *Asymmetrical Seizures* *Posturing Flaccidity* *extrapyramidal movements* *Blood Sugar…… mg/dl*	**EXPOSURE** *Temp…….°F* *Color Normal Pallor Cyanosis Ashen Grey Skin* *Surface Findings Rash Abscess Pustules* *Cellulitis PetechiePurpura Ecchymosis* *Hemorrhagic nodules Mucosal ulcers* *Dermatosis Desquamation Edema* *Trauma / Others(Specify……..*

Any other important gross clinical finding:-

FINAL PHYSIOLOGICAL IMPRESSION o Stable o Respiratory Distress o Respiratory Failure o Compensated Shock o Hypotensive Shock o Cardiopulmonary Failure o Primary Brain/Metabolic Dysfunction	**TRIANGLE CLASSIFICATION** o Level 1 (Resuscitation) o Level 2 (Emergent) o Level 3 (Urgent) o Level 4 (Less Urgent) o Level 5 (Non Urgent)

Clinical Findings:

Pallor: Y/N Icterus: Y/N Lymphadenopathy: Y/N Edema: Y/N

Cyanosis: Y/N Hydration: Y/N

Signature of Candidate **Signature of Supervisor**

- **Clinical findings:**

CNS		**GASTROINTESTINAL SYSTEM**	
CVS		**GENITOURINARY SYSTEM**	
RESPIRATORY SYSTEM		**MISCELLANEOUS**	

FINAL DIAGNOSIS:

ASSOCIATED DIAGNOSIS:

ANY COMPLICATION DURING PICU STAY: Y/ N

If Yes then specify:

TREATMENT

- **Ventilation NIV- Yes/No**
- **Mechanical ventilation**
- **Duration**

Yes No Duration

- **VASOACTIVE MEDICATION-**

Dopamine
Dobutamine
Epinephrine
Norepinephrine

- **ANY TRANFUSION- Yes No No. of units**
- **PRBC**
- **RDP**
- **SDP**
- **Cryoprecipitate**
- **FFP**

Signature of Candidate **Signature of Supervisor**

ET tube size

DATE/ TIME	MODE	PIP	MAP	PEEP	I:E	VT	VTe	$ETCO_2$	ft_{total}	fs_{et}	Ti	P_{supp}	FiO_2	PaO_2	SpO_2	C_{static}

Signature of Candidate **Signature of Supervisor**

- **ARDS yes/no**
- **PRISM SCORE:**

- **SOFA SCORE:**

OUTCOME:

- **DATE OF DISCHARGE**
- **DAMA**
- **DEATH**
- **Duration of hospital stay in PICU**
- **Duration of hospital stay in ward**
- **Lab Investigations:**

HEMOGRAM:

	DAY 1
Hb(hemoglobin)	
Platelet count	
TLC	
Neutrophil	
Lymphocyte	
RFT • **Urea** • **Creatinine** • **Sodium** • **Potassium** • **Chloride**	
LFT • **Total /Direct Bilirubin** • **SGOT/SGPT** • **ALP** • **Total Protein** • **Albumin**	

Signature of Candidate **Signature of Supervisor**

INFORMED PATIENT CONSENT

Date: _____

I…….D/o, W/o, S/o……..…… am willing to participate in the study **"RESPIRATORY COMPLIANCE IN CHILDREN ON MECHANICAL VENTILATION"** The procedure with its complications has been explained to me in local vernacular language. I have fully understood that no special tests and extra expenditure in any form, merely for the purpose of thesis is being carried out. I am free to opt out the study any time without assigning any reason.

……. ……
Signature of the Witness Signature of the patient

Name:

Signature of Candidate **Signature of Supervisor**

मरीज अनुमति फार्म

तिथि _____

मैं _____ पत्नी/पुत्र/पुत्री _____
निवासी _____
इस शोधकार्य "**RESPIRATORY COMPLIANCE IN CHILDREN ON MECHANICAL VENTILATION**" में भाग लेने के लिए सहमत हूँ। मैं इस शोधकार्य में भाग लेने के लिए अपनी स्वेच्छा से तैयार हूँ। मैं पुष्टि करता/करती हूँ की यह स्वीकृति देने के लिए मुझे कोई आर्थिक प्रलोभन नहीं दिया गया और न ही दबाव डाला गया है। मुझे इस शोधकार्य का उद्देश्य स्पष्ट कर दिया गया है और मुझे यह विश्वास है की यह विज्ञान और मानवता के लाभ के लिए है। मुझे इस शोधकार्य में होने वाले जोखिम के बारे में समझा दिया गया है और मेरी समझ में यह जोखिम बहुत मामुली है।

मैं इस शोधकार्य में भाग लेने के सम्बन्ध में किसी भी समय अपनी अस्वीकृति व्यक्त कर सकता/सकती हूँ और मेरे अस्वीकृति व्यक्त करने का मेरे इलाज पर कोई प्रभाव नहीं पड़ेगा।

_____	_____
गवाह के हस्ताक्षर	रोगी के हस्ताक्षर/अंगूठे का निशान
नाम:	नाम:

_____
अन्वेषक के हस्ताक्षर

_____
विद्यार्थी के हस्ताक्षर

ਮਰੀਜ਼ ਰਜ਼ਾਮੰਦੀ ਫਾਰਮ

ਮਿਤੀ_____

ਮੈ_____ਪਤਨੀ/ਪੁੱਤਰ/ਪੁੱਤਰੀ_____

ਵਾਸੀ _____

“RESPIRATORY COMPLIANCE IN CHILDREN ON MECHANICAL VENTILATION” ਤੇ ਚਲ ਰਹੀ ਖੋਜ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਰਜ਼ਾਮੰਦ ਹਾਂ। ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਮੈ ਆਪਣੀ ਮਰਜ਼ੀ ਨਾਲ ਤਿਆਰ ਹਾਂ। ਮੈ ਇਹ ਦਸਣਾ ਚਾਹੁੰਦਾ ਹਾਂ/ ਚਾਹੁੰਦੀ ਹਾਂ ਕੇ ਇਹ ਰਜ਼ਾਮੰਦੀ ਦੇਣ ਵਾਸਤੇ ਮੈਨੂ ਕਿਸੇ ਵੀ ਤਰਾਂ ਦਾ ਲੋਭ-ਲਾਲਚ ਨਹੀ ਦਿੱਤਾ ਗਿਆ ਅਤੇ ਨਾ ਹੀ ਕੋਈ ਦਬਾ ਪਾਇਆ ਗਿਆ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਦਾ ਮਨੋਰਥ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਭਰੋਸਾ ਦਵਾਇਆ ਗਿਆ ਹੈ ਕੇ ਇਹ ਖੋਜ ਵਿਗਿਆਨ ਅਤੇ ਮਾਨਵਤਾ ਦੀ ਭਲਾਈ ਲਈ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਵਿਚ ਹੋਣ ਵਾਲੇ ਖਤਰੇ ਬਾਰੇ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਯਕੀਨ ਹੈ ਕੇ ਇਹ ਖਤਰਾ ਬਹੁਤ ਮਾਮੂਲੀ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਦਾ ਢੰਗ – ਤਰੀਕਾ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ।

ਮੈ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਬਾਰੇ ਆਪਣੀ ਰਜ਼ਾਮੰਦੀ ਕਿਸੇ ਵੀ ਸਮੇ ਵਾਪਸ ਲੈ ਸਕਦਾ ਹਾਂ/ ਸਕਦੀ ਹਾਂ ਅਤੇ ਮੇਰੀ ਰਜ਼ਾਮੰਦੀ ਵਾਪਸ ਲੈਣ ਦਾ ਮੇਰੇ ਇਲਾਜ ਤੇ ਕੋਈ ਅਸਰ ਨਹੀ ਹੋਵੇਗਾ।

_____ _____

ਗਵਾਹ ਦੇ ਹਸਤਾਖਰ ਮਰੀਜ਼ ਦੇ ਹਸਤਾਖਰ

ਮਿਤੀ_____ ਮਿਤੀ_____

ਪਤਾ _____ ਪਤਾ _____

_____

ਨਿਰੀਖਕ ਦੇ ਹਸਤਾਖਰ

_____

ਸਿਖਿਆਰਥੀ ਦੇ ਹਸਤਾਖਰ